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TABLE OF CONTENTS FIRST PAGE

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TABLE OF CONTENTS

ORIGINAL ARTICLES

PAGE

Changing Aspects of Bronchoesophagology
Thomas E. Douglas, M.D., Seattle 397

Nasal Roof Repair and Hump Removal
Maurice H. Cottle, M.D., Chicago 408

Prevention and Correction of Cicatricial Intranasal Adhesions in Rhinoplastic Surgery
Michael L. Lewin, M.D., New York 415

Complications of Tonsillectomy
R. L. Works, M.D., Los Angeles 423

The Intranasal Use of Hydrocortisone Alcohol
Louis E. Silcox, M.D., Philadelphia 431

Malignant Tumors of the Nasopharynx
H. James Hara, M.D., D.Sc.(Med.), Ph.D., Los Angeles 440

The Conductive Mechanism of Hearing and Recruitment
Donald M. Markle, M.Ed., New York 453

Invalidity of the Physiologic Inference of Ewald's Law—Its Clinical Importance
Julius Winston, M.D., Philadelphia 459

Differential Diagnosis of Communication Disorders in Children Referred for Hearing Tests
Shulamith Kastein and Edmund P. Fowler Jr., M.D., New York 468

Cancer of the Larynx
William H. Baltzell, M.D., and F. Johnson Putney, M.D., Philadelphia 478

Chemical Burns of the Esophagus
Harold Owens, M.D., Los Angeles 482

Reconstruction of Auricle Following Excision of a Cancerous Growth
Albert P. Seltzer, M.D., Sc.D., Philadelphia 487

Hearing Rehabilitation in Private Practice
Frederick R. Guilford, M.D., Houston, Texas 490

CASE REPORTS

Eosinophilic Granuloma of the Frontal Bone
Benjamin H. Shuster, M.D., and Thomas F. Flynn Jr., M.D., Philadelphia 501

Rhinoscleroma Successfully Treated with Oxytetracycline (Terramycin)
Thomas W. Folbre, M.D.; Louis Manhoff Jr., M.D., and Dean W. Frazier, M.D., San Antonio, Texas. 505

CLINICAL NOTES, NEW INSTRUMENTS AND TECHNIQUES

New Cartilage Knife for Rhinoplasty
Benito B. Rish, M.D., New York 508

A Simple Device for Binaural Testing
Abraham I. Goldner, M.D., Flushing, N. Y. 510

SPECIAL REPORTS

Hearing Aids Accepted by the Council on Physical Medicine and Rehabilitation of the American Medical Association, as of Sept. 1, 1954 514

REGULAR DEPARTMENTS

Abstracts from Current Literature 518

Directory of Otolaryngologic Societies 523

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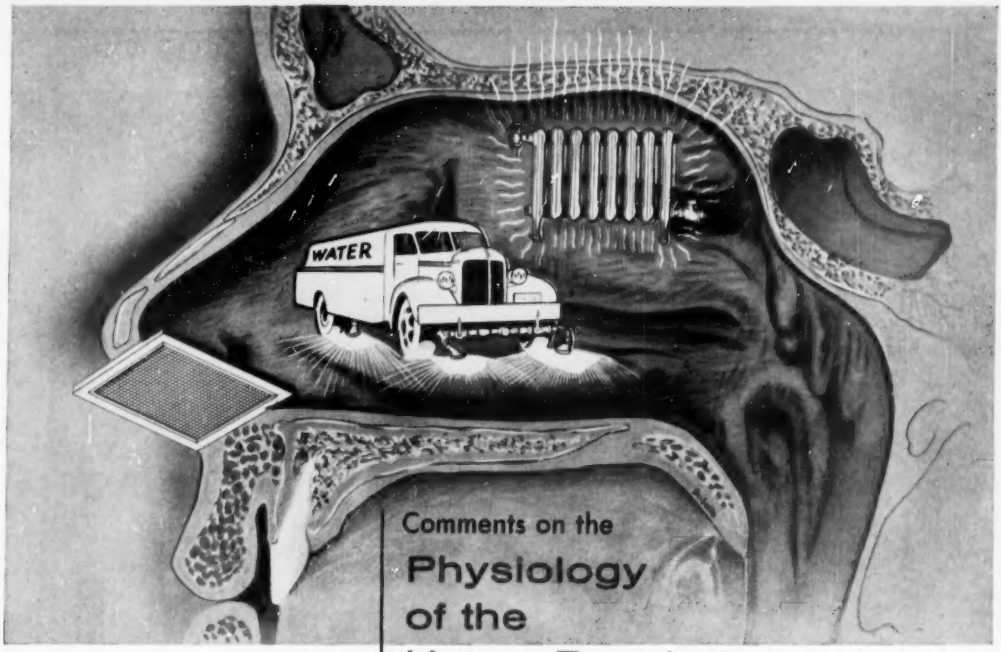

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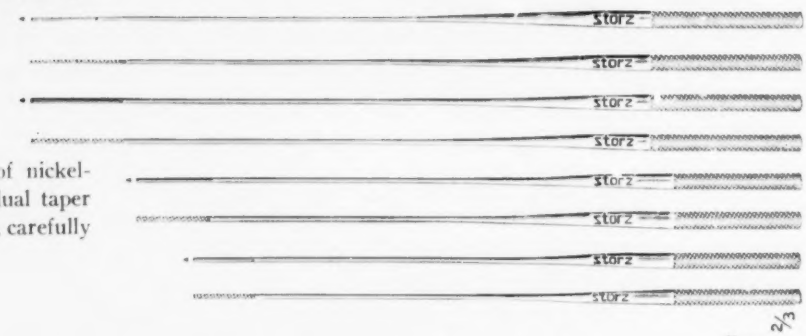

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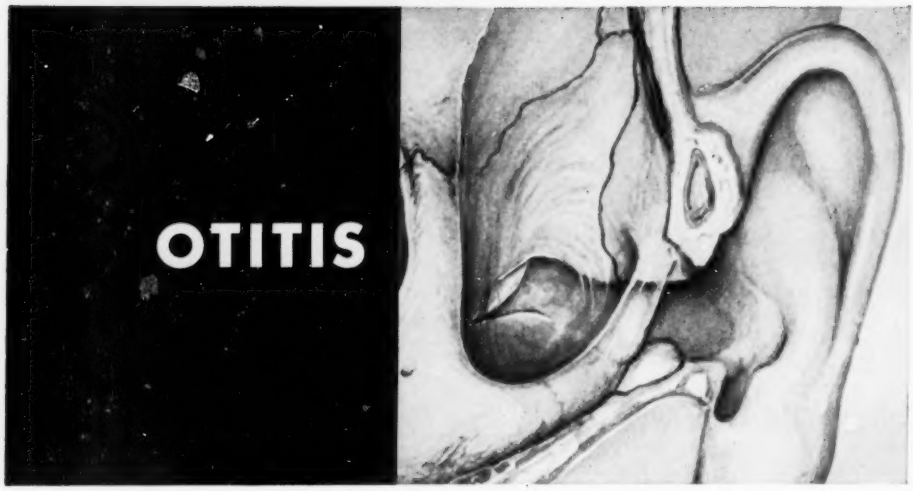

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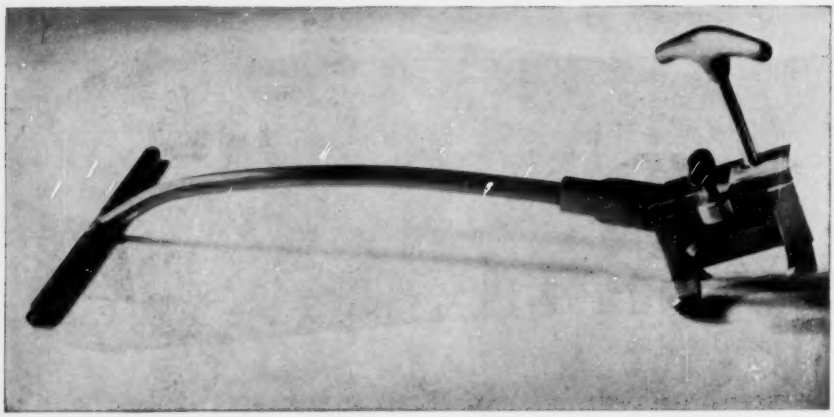

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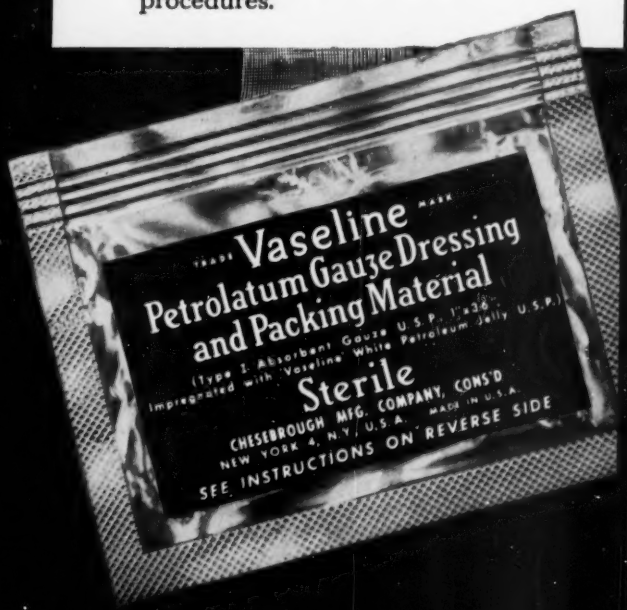
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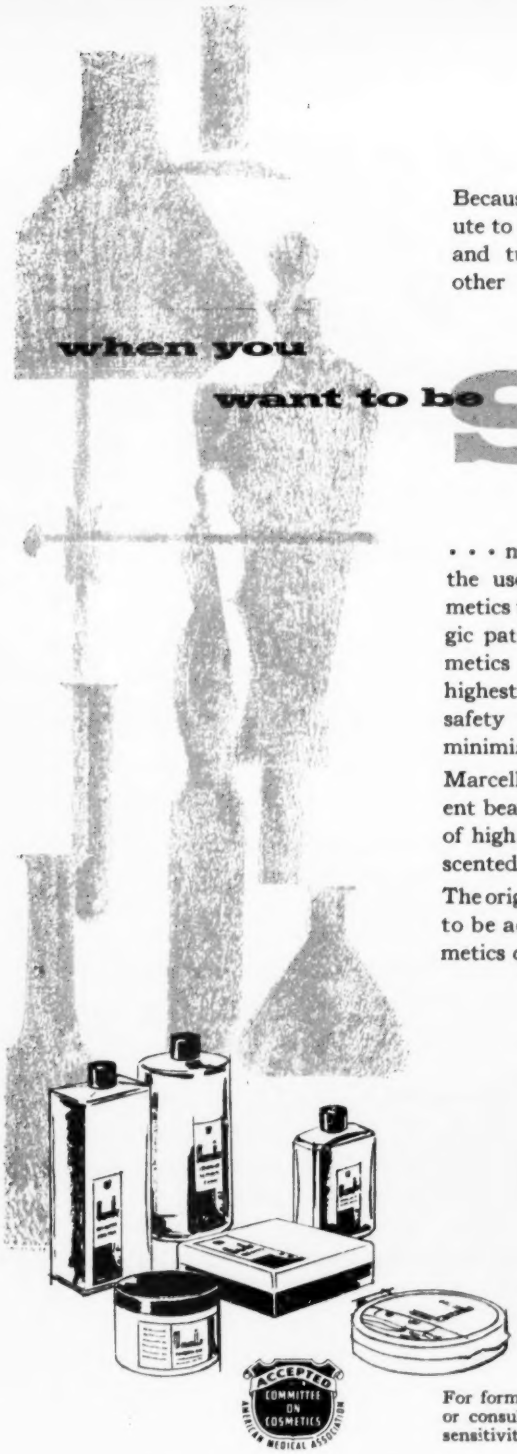

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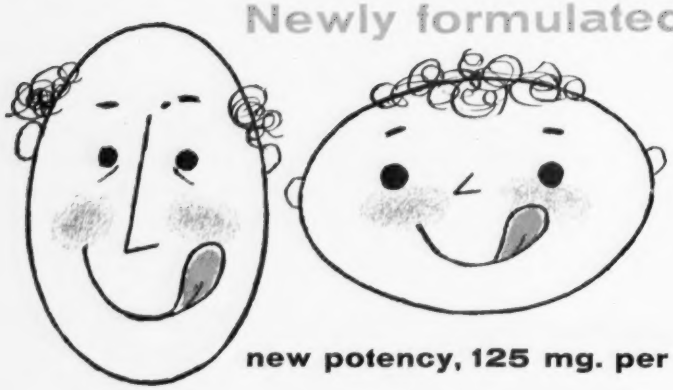

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CHANGING ASPECTS OF BRONCHOESOPHAGOLOGY

THOMAS E. DOUGLAS, M.D.
SEATTLE

TO MOST persons the terms pertaining to the subdivisions of peroral endoscopy imply a static, mechanical speciality. Even the endoscopists do not often fully realize the changes which have occurred in their field. The vastness of the diagnostic and therapeutic channels which have come under the endoscopist's realm have overshadowed the field of foreign-body extraction, although these added interests and the improvement in thoracic surgery have, by no means, minimized the importance of the foreign-body work.

Thirty-five years ago the bronchoesophagologist's time was occupied almost exclusively in the removal of foreign bodies from the food and air passageways. Today only 2% of the cases involve foreign bodies. Regardless of their static and mechanical nature, vast changes have occurred which alter the significance, the ease of diagnosis, and the removal of the foreign body.

The roentgen diagnosis of the nature, shape, and size of foreign bodies was usually relatively simple until civilization turned toward plastics. Plastic toys, boxes, pencils, jewelry, cigarette cases, and innumerable other household, kitchen, and business gadgets have complicated the roentgenologist's and endoscopist's lives. Toys used to be of metallic origin. Today's youngsters play with plastic cars, trains, soldiers, dolls, planes, and miniature household items.

The newer plastics are less radiopaque than were their predecessors. Nothing forms a better example of this than today's acrylic dentures. Not only could the dentures of yesteryear be outlined by x-ray studies, but the off-shade coloring enabled the endoscopist to identify the denture more easily. The acrylic plates are light and produce wonderful likenesses to the original teeth, gums, and palate. The nature of the material makes it impossible to be outlined by x-ray, and the degree of perfection which has been attained in color matching is distressing to the esophagoscopist as he attempts to delineate the dental plate from an infected edematous esophageal mucosa.

Plastics has not been the only field to complicate the endoscopist's endeavors. No sooner did the metallurgists complement the peroral endoscopist's realm by developing a smaller, more powerful and less brittle magnet, which can be adapted for employment through the bronchoscope, than they turned around and devised and improved other alloys which are nonmagnetic. The magnet seemed almost specifically designed for the straight pin—as once it made contact with the magnet it left no jutting points to impinge. The magnet is better able to maneuver a straight pin from

Presented at the 37th Annual Meeting of the Pacific Coast Oto-Ophthalmological Society, Los Angeles, May 25, 1953.

the smaller bronchioles than is a forceps. Today, however, scientific developments have given us the nonmagnetic, bronze straight pin to further test and improve our techniques.

Development of biplane fluoroscopy by Dr. Willes Manges was a most definite step forward. Its need has been accentuated by the nonmagnetic and the nonradiopaque foreign bodies.

The number performing endoscopic procedures is many times that of the 1920's. Consequently, the number of foreign bodies per endoscopist has diminished. Today, however, endoscopists are partially able to overcome this handicap by trading on the teaching experiences of the pioneers of this field, by an improved armamentarium of instruments, and by revised state laws which allow for animal experimentation.

The thoracic surgeon is able to remove foreign bodies from the food and air passageways through improved techniques, control of blood chemistry, and use of antibiotics that the physician would never have dreamed possible two or three decades ago. However, the fluency of the thoracic surgeon should not allow the endoscopist to become slipshod in his approach to foreign bodies, as the peroral approach remains the safest, simplest, least debilitating, and least costly procedure.

Richardson's work with extracts of papaya has eliminated most esophagoscopies for extraction of meat, fish, or fowl. Caroid or its active enzyme, papain, is able to relieve the patient of this type of foreign body within minutes. The attending physician should, however, further study the patient to determine the underlying pathology which prompted the bolus to become arrested in its passage through the esophagus.

The development and improvement of contrast media have augmented the diagnosis of nonopaque foreign bodies, congenital anomalies, and traumatic deformities. After removal of the foreign body or surgical correction of the deformity, one is able to follow the clinical course of the resultant strictures, abscesses, or bronchiectasis through roentgenograms, which may utilize tomography or contrast media.

The antibiotics and chemotherapeutic agents have brought about a marked reduction in the number and severity of complications. Foreign bodies, aspirated tonsillar tissue, and tuberculosis leave different impressions than they did two decades ago. The obstructive nature of the foreign body or its ability to penetrate one of the great vessels of the mediastinum has overshadowed its former importance of producing mediastinitis or lung abscess.

The antibiotics and chemetherapeutic agents have brought about a marked reduc- have eliminated the local treatments of chaulmoogra oil and silver nitrate (which were applied directly to individual lesions through the bronchoscope). Bronchoscopy enables direct visualization of the efficacy of the antibiotics. The bronchoscopist no longer refuses to bronchoscope the tuberculous patient as he now knows that dissemination of the infection will not be aggravated by the endoscopic procedure. Indeed, the phthisiologist and bronchoscopist (if they be two persons) both rely upon direct visualization, the findings of which dictate whether collapse or other surgical therapy should be instituted at a particular time.

The antibiotics, aided by humidifiers, have lessened the bronchoscopy rate and the frequency of tracheotomy in the care of patients with acute laryngotracheobronchitis. Most do not require the constant bedside attention of the endoscopist with the accompanying worry which formerly plagued the physician and family.

The disappearance of epidemic typhoid fever and of diphtheria from the North American continent has relieved the bronchoscopist of many duties. The antibiotics and fluid balance can now adequately control the endemic typhoid cases as they become manifest. The routine vaccination of youngsters has almost justified the condensation of the diphtheria chapter to a few sentences in the ear, nose, and throat textbooks.

The relative and absolute increase in those afflicted with asthma is of concern to the bronchoscopist. The advent of the antihistamines, of corticotropin (ACTH), and of cortisone has materially aided the available armamentarium with which to treat these persons. They have not, however, eliminated the need for autogenous vaccines made from tracheobronchial secretions. They have not eliminated the occasional bronchoscopy for status asthmaticus during which the airway is cleared of blocked secretions and epinephrine solution is instilled. They have not eliminated the value of aspiration bronchoscopy in those patients with concomitant asthma and bronchiectasis. They have not eliminated the diagnostic bronchoscopy during which procedure infectious diseases such as tuberculosis, growths such as adenomas, and foreign bodies are ruled out .

Studies of the anatomy and physiology of the tracheobronchial tree and of the etiologies underlying the pathologic processes therein have enabled physicians of all specialities to reduce the need of endoscopic procedures. The continual harping regarding the importance of intraluminal occlusion and its relation to bronchiectasis has resulted in its awareness by the pediatrician in the newborn, by the surgeon in the postoperative patient (instead of a diagnosis being made of "pneumonia"), and by the geriatrist in the aged.

Prophylaxis during tonsillectomies, improved anesthetic techniques, early postoperative ambulation, shifting positions for the bed-ridden patient, encouraging cough to expel secretions, adequate intravenous therapy to supplement the oral ingestion, and aspiration in the newborn have all helped to reduce the number of pulmonary complications and the need of continued therapy over a period of weeks, months, or a lifetime.

Less frequently does the roentgenologist and/or clinical physician describe a pneumonic process without modifying the report by adding the words "produced by intrabronchial occlusion." As a result, fewer cases of bronchiectasis are occurring. Those that do occur are often limited to a lobe or its subdivisions. The development of thoracic surgery has aided the bronchoscopist by materially reducing the number of chronic bronchiectatic persons who require routine aspiration of the thick foul secretions which are too tenacious for the patient to mobilize through the act of coughing. Surgical extirpation of the diseased area has lessened the frequency of pulmonary infections to which these persons are subject and has, thereby, decreased the need for aspiration followed by medicinal instillations into the affected bronchioles. Bronchoscopy, however, remains the best means—and sometimes the only method—of removing the secretions in those who have too many lobes affected to be cured by surgical extirpation. Brochoscopic aspiration immediately before operation has enabled the thoracic surgeon to remove the bronchiectatic or abscessed tissue without fear of the secretions gravitating to other lobes, thus seriously inter-

fering with alveolar aeration. The increased knowledge of the physiopathology of bronchiectasis has resulted in the bronchoscopist's being prophylactically called to duty more often to aspirate secretions.

One of the most striking changes in the conception of the physiopathology of a disease process has been in the field of anthracosilicosis. Motley has repeatedly shown, as have his associates (Gordon, Theodos, Lang, and Tomashefski), that much of the respiratory embarrassment in patients with anthracosilicosis is due to bronchospasm and not entirely to fibrosis, as was dogmatically dictated in former years. Through the use of intermittent positive pressure breathing exercises, they have been able to rehabilitate many of these patients to a useful and pleasurable life. Smart, Davenport, and Pearson have shown excellent results in treating emphysematous patients with intermittent positive pressure. Marked improvement in respiratory function has followed such therapeutic regimens for all types of chronic pulmonary disease.

Poliomyelitis is the field which has taken great strides in recent years. The furor at the present is, of course, the hope that the vaccine will prove of value.

Bower, Bennett, Dillon, and Axelrod have applied the Bennett intermittent positive pressure respirator to bulbar poliomyelitis cases. They have found that positive pressure breathing and use of nebulization to instill wetting agents, humidifiers, bronchodilators, and antibiotics (as indicated by each case) have decreased the mortality in a comparable series of bulbar poliomyelitis patients to 17% from the 68%, which was prevalent when the Drinker-Collins respirator alone was employed.

Dr. Thomas C. Galloway has been instrumental in emphasizing that many cases diagnosed as bulbar poliomyelitis end in death from depression of the medullary centers due to carbon dioxide accumulation and anoxia and that, in reality, paralysis of the respiratory centers is not present in many cases. He has shown (as has the Minnesota group of Priest, Boies, and Goltz) that early, selected tracheotomy is to be favored instead of looked upon with distain. He has shown that a tracheotomy is necessary to bypass the pharyngeal secretions which would otherwise be drawn into the tracheobronchial tree with inspiration; that continuous pharyngeal aspiration of secretions, postural drainage, careful tracheal toilet, and an oxygen catheter are prerequisites in supplementing the general fluid balance and nutrition of these patients. He has emphasized that procrastination is dangerous, that cyanosis is a poor sign of impending anoxia, as the carbon dioxide accumulation is an earlier and much more dangerous factor—and it produces no cyanosis.

The endoscopic field can be credited with altering the concepts of bronchiogenic carcinoma. Prior to the adoption of the Papanicolaou staining technique to bronchial secretions, textbooks were prone to describe the major bronchi as the site of origin of the neoplastic growth. Certain lobes were favored over others in frequency. Today, however, the ubiquity of the lesion is becoming recognized. Prior to Dr. Louis H. Clerf's and Dr. Peter Herbut's description of the feasibility of staining the bronchial secretions, the disease was considered undiagnosable until it reached the stage of being incurable. Employment of stained bronchial secretions as a diagnostic procedure enables the surgeon to operate, having a definitive preoperative diagnosis. He no longer has to rely upon the exploratory thoracotomy or upon the feel of the involved pulmonary tissue or waste minutes awaiting results of the frozen

section. He is able to operate upon the early cases with impunity of thought and action. Dr. Clerf and Dr. Herbut have shown how to diagnose bronchiogenic carcinoma in its early stages. They have revised our thinking by showing that the peripheral lesions are more easily and more completely resected than are their counterparts of the major bronchi. They have given a method of diagnosing the lesion before it has spread enough to become visible by bronchoscopic means.

Dr. Herbut has shown that bronchoscopy for the collection of secretions for the Papanicolaou staining technique not infrequently results in the pathologist's calling attention to collections of ciliated epithelial cells, which are indicative of tuberculosis if they are found in clusters. Finding Langhans' giant cells makes the diagnosis more presumptive. Cultures and smears of the aspirations are usually concluded by a definitive diagnosis of the presence of an acid-fast infection.

The field of ingested caustics is being handled, on the whole, more satisfactorily. There remains the need to emphasize to all who first see these patients that endoscopy and dilatations should not be withheld until the esophageal lumen becomes obliterated, until the patient becomes emaciated, and until a gastrostomy is required to maintain life; that they should not be withheld until the laryngeal stenosis necessitates emergency tracheotomy; that they should not be withheld until the esophageal fluids pass, for want of an opening, into the trachea, with resultant bronchitis, pneumonitis, and bronchiectasis. Proper labeling has done much to insure and lessen the ratio of persons' accidentally taking caustics. Education has failed to reach those with suicidal intents, to tell them that death by ingestion of lye is rare but the sequelae long and tortuous. The endoscopist has learned a great deal these last years concerning the desirability of immediate endoscopy and dilatation. He has learned the importance of maintaining a perpetual esophageal string until such time as the esophagus remains statically dilated. To date, the field of thoracic surgery has not been able to handle these cases with the impunity which any endoscopist would like. There is too much periesophageal involvement with resultant fibrosis for one to glibly transfer these cases for thoracic surgery. Extensive fibrosis usually means that the great vessels of the chest, the vagus and phrenic nerves, the myocardium, and pulmonary tissue cannot be safely nor adequately separated from the diseased esophagus unless the esophageal involvement is of an annular nature and of limited length.

Achalasia or cardiospasm remains in the endoscopist's field. Surgical extirpation of the cardia would appear to be the ideal treatment of choice. Unfortunately, however, surgical failures equal those of the endoscopist's endeavors with dilators. Therefore, conservative esophageal dilatation should be the only therapy of choice until such time as its failure is proved or until complications require surgical intervention.

The rapid ascendency of thoracic surgery has resulted in fluidity of pendular motion. As is true of any recent invention or procedure, an instability is present which can only be corrected through time and practice. The fields of esophageal and pulmonary neoplastic disease, pulmonary tuberculosis, and strictures and stenoses are rapidly approaching equilibrium. Statistical data have been accumulated for enough cases over a period of time so that the rational of a given procedure for an individual lesion may be viewed in the light of cold statistical figures. Results on

other lesions, however, remain in a state of buoyancy. Bronchial adenomas are such an example. Many schools feel that all adenomas should be surgically removed along with the accompanying adjacent pulmonary parenchyma. Others, however, hold that the percentage of adenomas which become malignant is small enough to warrant endoscopic removal. The patient is then followed at periodic intervals by means of bronchoscopy and tomography. If the lesion recurs, shows formation of the extrabronchial dumbell growth, or its histologic appearance becomes more irregular, then they say it is time to resort to surgical removal.

While thoracic surgery and the various plastics have relieved the endoscopist of many problems, they have, nevertheless, produced several of their own.

Tracheal adenomas and neoplasms can be rationally referred for surgical extirpation. Few difficulties are anticipated if a primary anastomosis can be performed. More often, however, the nature and size of the lesion dictate that the degree of surgical excision must exceed that which will allow for primary closure of the tracheal wall. Metallic and plastic tubes have conquered this difficulty. Both, however, are devoid of cilia. Without cilia secretions are prone to stagnate distal to the implant. Many patients find postural drainage to be a difficult, and sometimes an almost impossible, method of clearing the tracheobronchial tree of secretions.

Occasionally the plastic or metallic implant may become loosened and slip distally, thus occluding the airway. Sometimes an implant migrates to the subglottic region. Riding in this position, it may produce enough inflammatory reaction to result in laryngeal stenosis. Then another problem has been created, to which attention must be given. Fortunately, however, tracheal lesions are infrequently encountered, and the postoperative sequelae which develop are of a less severe nature than is nonintervention or tracheoscopy for dilatation of the strictures or fulguration of the lesion.

The field of anesthesiology has not ridden the crest sufficiently long to allow the pendulum to swing to equilibrium. The development of positive pressure anesthesia has been noteworthy, as has the introduction of thiopental (Pentothal) sodium and curare. Intratracheal anesthesia has also been a most valuable adjunct to the fields of anesthesia and surgery. However, it has overrun its usefulness in many ways. The surgeon and anesthetist are relying too much on its use for procedures which do not warrant its employment. Many anesthetists who are finishing their training are afraid to give tonsillectomy anesthesia without an intubation tube in situ. Indeed, the same feeling is prevalent among many of the otolaryngologists who are today entering the world of private practice. The laryngologist is seeing too much laryngeal pathology which is the direct result of excessive intubation, incorrect intubation, and repeated intubation. This is especially the case in children. Too often the laryngeal airway is of incorrect size. Too often it is hastily forced through the glottis. Too often the child continues coughing, each time forcing his cords and arytenoids against the hard airway.

With an airway in situ many anesthetists feel assured of the patient's safety. Little do they realize that an intubation cannula can increase rather than decrease the chances of aspiration. Ruth has shown that reliance upon endotracheal intubation to prevent aspiration of pharyngeal or gastric secretions is fallacious. The numbers of patients who aspirated gastric secretions during operation were almost identical whether the operation was done under open-drop anesthesia, with

an intratracheal tube in situ, or with an intracheal cannula with an inflated cuff. The percentage of aspirating patients was statistically equal for well-trained anesthetists, for moderately well-trained anesthetists, and for those in the infancy of their training period.

The anesthetist often acquires a feeling of complacency when intubation is completed and feels free to leave the patient's side. He does not follow the patient postoperatively. He does not treat the granulomas and other laryngeal pathology, which is the direct result of intubation. It is the surgeon who remains responsible for the patient's welfare. This being the case, it is his responsibility to see that he has the type of anesthesia which he knows is best for his particular patient.

Improved methods of anesthesia have influenced endoscopic procedures. Local anesthetic techniques have improved so that smaller quantities of a less concentrated solution may be employed. Fractionated intracheal instillations of a 0.5% tetracaine hydrochloride (Pontocaine) solution or of a 1% cocaine solution result in anesthesia of the desired mucosa. Gargling with the local anesthetic agent has been found to be superfluous, as the cough and expectoration acts anesthetize the pharynx. Thus a smaller amount of the local anesthetic agent is used, and fewer and less severe reactions are encountered.

The introduction of thiopental sodium and curare has become widely accepted by endoscopists. Usage of this combination is not to be condemned when it is used by those who are adept in handling its various manifestations. However, routine use of this hypnotic or any general anesthetic agent is to be condemned as bad medicine, as is any procedure which becomes dogmatically routine. Then the thought processes are diminished. Then variations are not being applied to best suit the individual case. The local anesthetic remains the simplest of application and the safest. It is, therefore, the anesthetic of choice for most endoscopic procedures.

We should not become too enthusiastic in acceptance of new things lest we forget that the simplest is often the best. We must remember that, although an endoscopic procedure may take a few minutes longer if locally anesthetized, our prime objective is to maintain and improve the patient's life rather than to perform the endoscopic procedure by whatever method is easiest for us and the patient.

SUMMARY

Stasis has no place in the field of peroral endoscopy. Not only have the endoscopist's methods and criteria changed, but invading and allied fields have made themselves felt by altering the pathologic conditions which the endoscopist sees and treats. Only visionary speculation can anticipate the metamorphosis which may influence the field of bronchoesophagology, as that which is best today may be the antithesis of tomorrow's therapy.

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ABSTRACT OF DISCUSSION

DR. JULIUS WEBER, Seattle: That was a very nice discussion of the whole field of bronchoesophagology as I see it today. It is true that plastics are new, but we also have developed better instruments, judgments, skills, and experience to cope with the situation at hand.

Antibiotics have reduced the incidence of mediastinitis, which we used to see with foreign bodies, so we do not have to worry so much about that any more. We have gone through the period of doing many bronchoscopies for bronchial asthma, bronchitis, and bronchiectasis

mainly because we recognized sinus infection and treated it properly. As a result, we have done away with those cases in which the patient had a drip down his bronchial tube and a secondary infection.

Further than that, the recognition and control of allergy is a tremendous step forward. Along that line, we are also able to decrease bronchial secretions. One of my favorites is histamine; I also use dust and other pollen-elimination shots. Over half of the bronchoscopy work is diagnostic rather than therapeutic; where we used to aspirate lungs for these various conditions, now we are doing diagnostic work more than anything else and, of course, remove very few foreign bodies compared with the other work that we do.

The poliomyelitis work is a tremendous step forward, as Dr. Douglas mentioned, and we are saving a great many more patients. The work in cancer cells is the biggest step that we have made, I believe. The chest surgeon is enabled to go in and do a thoracic operation.

The cardiospasm situation is one that went overboard with too much surgery for a while, and we were having pretty good results with the mercury balloon. I have had several patients who have been worse after surgery because they would regurgitate the gastric secretions into the esophagus more than ever. They would have to sit up to sleep rather than lie down. However, the thoracic surgeon can now handle the situation better. As far as benign tumors of the tracheobronchial tree are concerned, I believe that these adenoma cases that we used to quietly cauterize can now be resected. We had one noted case of extensive adenoma of the trachea that one of our surgeons resected after I had cauterized it several times. A stainless steel tube was put in, and it worked out very well; however, the patient died three weeks later. The disease was not cured, but the operation worked. The tube remained fairly clean, and the secretions did not stick in the tracheal tube. It was not a tracheotomy tube.

Another thing we can look forward to more now is the earlier diagnosis of cancer of the esophagus. We have to pay more attention to the food sticking, especially in adult man. We have to first fluoroscope more of these cases to detect early carcinomas, because the chest surgeons are now able to resect the esophagus quite successfully, at least mechanically so. We are beginning to have a few cures.

The progress of chest surgery brings up another new item in our field, and that is the following: In the newborn infants we are having more of these operations on the esophagus, and we are now receiving the esophagus strictures that we have to treat postoperatively. They are not so easy to treat in my experience.

The stricture cases that I have had to deal with were due to caustics. The first thing to do, as Dr. Douglas said, in these acute emergencies, is to get something down the esophagus, a catheter or something. The patient should not be dismissed until a competent endoscopist has decided that the passageway is satisfactory and will not require too extensive treatment later on.

Dr. Joel Pressman, Los Angeles: A more comprehensive, well-considered outline of the changing aspects of bronchoesophagology can hardly be imagined. If one studies the papers as carefully as I have done, he will find them full of wisdom.

Dr. Douglas has summarized the situation beautifully and, in so doing, has emphasized and clarified any number of interesting and important points. These require no further comment from me.

It is entirely obvious from what he has said that not only is peroral endoscopy undergoing constant change but equally so is the identity of the endoscopist. I am afraid that we, as the leaders in this field, have not taken sufficient cognizance of this, and that we must recognize that there are others who, although less technically qualified, have, all things being fairly considered, every reasonable right to include endoscopy within their spheres and perhaps an even more legitimate interest in the field than we have.

They are, however, presently dependent upon us for training and for the solution of certain difficult endoscopic problems which they themselves are not technically qualified to solve, and perhaps will not be for a long time to come; though as time goes on, they will be more able to do so and we still become less able to solve them by virtue of diminishing experience.

The reason for this is the skill, foresight, and ingenuity in endoscopy as the result of broad experience, and the simple fact is that the experience of the laryngologist is lessening day by day, and the endoscopic experience of the thoracic surgeon is broadening day by day.

We are still the keystone of the specialist. No important advance in endoscopic technique has yet been made by a thoracic surgeon. No important teaching center of endoscopy is functioning under the control of the thoracic surgeon, and no significant improvement in armamentarium has been produced by anyone doing endoscopy other than ourselves.

Likewise, there is no great center of endoscopy to which problem cases can be sent except those under the control of the laryngologist. No thoracic surgeon has as yet acquired the skill of the Jacksons, the Tuckers, or the Holingers. No thoracic surgical clinic remotely compares with the center for reference of difficult problem cases with that established by Dr. Simon Jesberg, and which was broadened and continued and developed right here in Los Angeles by Dr. Alden Miller, and is functioning as part of the University of Southern California School of Medicine.

Our specialty is the father and the mother of this field, and yet we are, say what you will, abandoning it partly by desire and partly by force. As a matter of fact, only a very small percentage of our own have actually been attracted to this field, and, except for an occasional stab at it, the truth is that only a very few laryngologists have done any appreciable amount of bronchoesophagoscopy. Our hold upon it has, therefore, never been one of numbers but of interest and skill and of contributions to it.

Now the day in which we can claim these cases exclusively for our very own is gone, but we are still the leaders, and we have the function of leaders in this work, as Dr. Douglas has so beautifully described. How can this function best be served? I have some very definite ideas upon it. The job of any leader is to lead, and that is just what we must do, but there is the burning question as to whom we shall lead in this ever-changing picture. As an answer to this, I would advise us to acknowledge instead of deny the right of others to engage in this work, to encourage them instead of discouraging them, to include them instead of excluding them, and to recognize the changing character of the interest in this field.

The modus operandi of such an effort on our part should be the formation of large, independent endoscopic services not part of any other service, not part of laryngology, not part of chest diseases, not part of any service at all, but independent unto itself, into which should come all having legitimate interest in this field—the laryngologist, the thoracic surgeon, the anesthesiologist, the gastroscopist, and others who might have a special need.

All should be included under this one service, and all should be taught what they need to know. The anesthesiologist would be far better prepared to avoid the complications of which Dr. Douglas speaks if he were given training by us instead of being neglected.

Training in endoscopy should be obtained in an endoscopic center, and the anesthesiologist needing this training is, therefore, a rightful member of the endoscopic service, and so on down through the various specialties. The laryngologist who does endoscopy needs association with the thoracic surgeon to learn about thoracic diseases, and there is a great deal each of us can learn from the other. The common meeting ground should be a common endoscopic center.

The future pattern, therefore, is a series of marriages. A new, large, all-inclusive endoscopic service must come into being. All endoscopic work, including laryngeal endoscopic work, at any hospital must become part of it, and leading it to its destiny must be whoever is best qualified to do so; who, up to now, is the laryngologist. I believe that if we will recognize the interests of others and cooperate with them and train them, the leaders in this field will always be the laryngologists.

Dr. Mervin C. Myerson, Beverly Hills, Calif.: This has been a very comprehensive presentation, and, if nothing else, it is provocative. There are many interesting phases of Dr. Douglas' paper which can be discussed.

All bronchoscopists speak of the biplane fluoroscope and lean heavily upon it. How about the man who is in a distant city, who does not have a biplane fluoroscope available? One can remove a peripheral foreign body with a uniplane fluoroscope, in my experience, more readily than with a biplane. The only exception might be the biplane fluoroscope designed and developed at the Children's Hospital here in Los Angeles. Instead of using the fluoroscope as a double plane, we use the patient as such.

We have a fluoroscopic screen placed above a patient lying on a table. Let us suppose a foreign body is in the left lower lobe peripheral bronchus. The fluoroscopist tells the bronchoscopist when his forceps are in line with the foreign body. Then the patient is turned obliquely,

and now instead of having the anteroposterior diameter, we have the side-to-side diameter. The fluoroscopist can tell the bronchoscopist that although his bronchoscope is in a perfect line with the foreign body, when the patient is in this position, it is a little to the left or right, and he finally enters the proper bronchus for removal of the foreign body.

I have removed 14 foreign bodies in this way and have removed most of them in a hospital in which we had a biplane fluoroscope. The biplane fluoroscope handicapped rather than helped me. Dr. Douglas mentioned the use of contrast media for finding nonopaque foreign bodies. They disintegrate rapidly. A piece of popcorn in a bronchus should be removed as soon as possible. The intern or resident must be instructed that when a patient with a vegetable foreign body comes into a hospital, the bronchoscopist must be immediately notified, so that the crisp, dry foreign body can be removed quickly. Once the foreign body becomes moist, it begins to disintegrate; and after it begins to disintegrate, when it is grasped with the forceps it breaks up into small pieces. A contrast medium simply exaggerates or increases the handicap.

At a large tuberculosis hospital we took 200 patients; upon 100 we used chaulmoogra oil, and upon 100 we used nothing. We found that the oil was a good lubricant but not a therapeutic agent.

I should like to impart an experience that has occurred several times since cortisone and corticotropin (ACTH) have been in use. It is not generally known to the ear, nose, and throat profession. If a patient has severe influenza laryngitis or acute laryngitis with edema and is a performer and needs his voice, corticotropin or cortisone will eliminate the edema within a few hours, so that the patient can use his larynx.

A patient who had an influenzal laryngitis with edema, which ordinarily would have taken 10 days or two weeks to be brought under control before she could have used her voice, was put on the radio within 24 hours after an intense edematous laryngitis was first seen, by using just 25 mg. of corticotropin.

A bronchoscopist could talk for an hour or more, because this paper is comprehensive and all-inclusive. There are many phases of bronchoscopy that one could touch on. I should like to tell you a story of an experience I had some 25 years ago with a case of asthma. A lady was being treated for asthma by a well-known internist. He had a young, very sharp assistant, who turned to him and said, "You know, doctor, the only thing that has not been done for this lady is bronchoscopy. Why not refer her for bronchoscopy?" She was referred to me for bronchoscopy. I knew when I examined her that I could never pass a bronchoscope on her because she was too tense. We cocainized her larynx, then passed a 9-mm. bronchoscope into her hypopharynx and held it there, and I took one of the heaviest forceps available. I said, "When I get down there I want you to put your finger on the place that gives you most trouble." She put her finger there, and I rattled the forceps in the scope. I pulled my bronchoscope and forceps out, and then I turned to the nurse when the patient sat up on the table and asked, "What time is it?" She answered, "Quarter after two." I said, "Don't you dare let this patient talk until this time tomorrow." The patient was cured. She was poverty stricken because of her asthma. The family had sold their furniture, and they were in bad financial condition. As a result of her cure she sent me many patients with asthma, whom I could not help.

DR. DOUGLAS: Dr. Myerson condemned the use of a contrast medium prior to foreign-body extraction. I wholeheartedly agree with him. However, it does have value for the occasional case of chronic cough in which a nonopaque (and I should add "nonsuspected") bronchial foreign body is found when a bronchogram is done. The local physician is then prompted to refer the patient for removal of the plastic objects, shell fragment, or vegetable matter. I might also mention that we used the aqueous contrast medium for a year. It is satisfactory for routine bronchograms but fails to produce the sharp, fine-lined delineation which is possible with the iodized oil preparations.

Dr. Pressman "stole my thunder," so to speak, in discussing the relative merits of the otolaryngologist or those of allied fields in performing bronchoscopy. I feel that the field of bronchoesophagology is suffering from a dispersion of efforts by these various groups. Just as each of us should be able to read his own x-ray films, the roentgenologist is more proficient in finding and interpreting pathologic processes than we are. He is often able to illustrate a shadow which we might interpret as being normal, and so it is with bronchoesophagology. We who do most of it should be more able to find and interpret the lesions than those who only occasionally do endoscopy.

Those in the allied fields who do endoscopy will find it to be too time- and energy-consuming if they can be assured of complete reports by the bronchoesophagologist. We should mention the appearance and motility of the larynx, the appearance, position, and motility of the carina, and any displacements, fixations, or disturbances of the physiopathology of the tracheobronchial tree. In short, if our reports are complete, those in allied fields will find welcomed relief in referring the patients for endoscopy.

If we are to train residents in otolaryngology, it is only right that we include bronchoesophagology and maxillofacial surgery in their training programs. Such programs will then dispel any fears the prospective trainee might have regarding the field of nose and throat as a disappearing entity.

I have had very little trouble dilating the postoperative suture line of the congenital esophageal stricture or atresia cases, as mentioned by Dr. Weber, unless the surgeon saved too much of the strictured area in attempting to lessen the degree of mobilization to produce primary closure. If some of the congenital stricture or atresia tissue remains, then it is quite difficult to dilate the area postoperatively.

In closing, I should like to thank each of the discussers. I feel as if I am "taking coals to Newcastle" by speaking before any of them, as each leaves a feeling of equanimity with the listener, whatever the subject on which he chooses to speak.

NASAL ROOF REPAIR AND HUMP REMOVAL

MAURICE H. COTTLE, M.D.
CHICAGO

A CONVEX prominence of the dorsum of the nose is referred to as a hump. The term "hump" implies an undesirable projection, and its removal and disposal would therefore appear desirable. Humps are surgically removed for cosmetic reasons by a variety of techniques, all of which follow essentially the principles originally described by Joseph [1] at the beginning of the century.

The use of the saw, the chisel, and the biting forceps has been extensively investigated in this connection, but regardless of the method of removal chosen, the surgeon has wished to do away with the hump effectively. This would conclude the discussion, leaving only the choice of patient and method of procedure to be decided; but there are two reasons why this subject cannot be considered closed: (1) the question of complications that sometimes follow hump removal and (2) the question of the function of the dorsum of the nose.

As to the first, there are three important, and not too infrequent, sequelae to the removal of the nasal roof; one of the commonest ones is observed and complained of by the patient, viz., the skin over the roof sinks into the nose, usually to a moderate degree. This may be due to actual sinking of the soft tissues into the nasal chambers if the remaining nasal bone fails to lie close to the septum when healing is completed. It may be due to an atrophy of the subcutaneous tissue or the skin, as a result of trauma during separation of the tissues from the nasal bones; it may be due to the contraction of scar tissue, resulting from trauma to the subcutaneous tissues, or it may be due to a combination of these causes. A most important reason may be the failure to recognize a congenital absence of all or part of the nasal bones, which may exist even in a nose with a prominent hump. (Fig. 1). A partial or complete destruction and absorption of the nasal bones may occur after childhood injuries and infections, and this may be accompanied by normal or accelerated growth of the septum and other structures. When bone is missing, cartilage and/or soft tissues take its place. Sawing through these produces a rough shredding and tearing, resulting in uncontrolled scarring and cicatricial contractures.

Patients complain frequently of vasomotor disturbances and the precipitation of actual allergy episodes following rhinoplasty, which, I believe, are in great measure sequelae to hump removal and disposal. Neuritic symptoms involving the supraorbital, parietal, and mastoid areas are also occasionally noted, aggravated by exposure to cold and other atmospheric conditions. The pains can be reproduced in some patients by cooling the surface of the nose or by passing a needle through the skin and mucous membrane in the area where the intact bony nasal bridge once existed but is now no longer present (Fig. 2). The relief of these symptoms by the creation

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Fig. 1.—Left, normal nasal bones. Right, congenital absence of nasal bones.

Fig. 2.—Lines indicate edges of bone remaining after rhinoplasty done 20 years previously; needle passes easily through dehiscence and reproduces referred pain to mastoid area (syndrome of open roof).

of a new roof of cancellous bone corroborates very strongly the conception of a clinical syndrome of the open nasal roof.

As to the second, there is a growing concern as to how much the removal of the nasal dorsum interferes with the function of the external nasal pyramid.

The nose referred to by the laity is actually the external nasal pyramid, or it may be called the external nose, to be contradistinguished from the nasal chambers and their contents, the internal nose. The latter contains primarily the functioning nasal mucous membrane draped over the septum and the turbinates, and is divided physiologically into a lower respiratory portion and an upper olfactory portion. These make a most significant contribution to the general sense of well being and good health of a person. Their preservation in a well-constructed nose is enhanced by the deep-set central location of the internal nose, which is protected from the external world by an insulating and isolating barrier of air spaces, bones, cartilages,

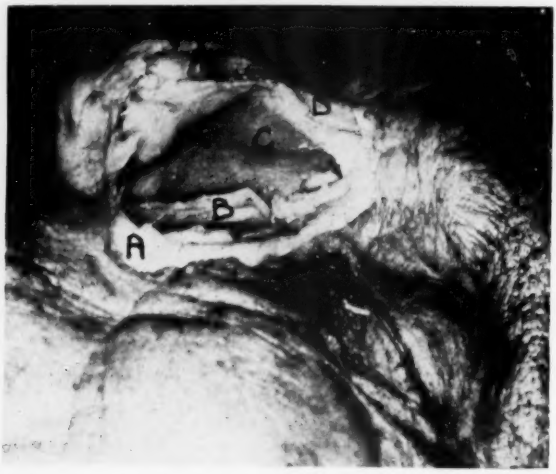

Fig. 3.—External nasal pyramid is an empty space (attic). *A*, edge of removed left nasal wall; *B*, edge of removed septum; *C*, intact inside appearance of right half of "attic;" *D*, dorsum (tegmen or roof).

and soft tissues. On either side of the nasal interior there are the maxillary antra and the ethmoidal sinuses; above, in front are the frontal sinuses; behind, the sphenoid; below and behind, the air-containing oropharynx. In front is the air-containing external nose divided by the septum. Its two small entrances, the nostrils, direct the air streams into the vestibules. Here the air is modified by the screening hairs, the vibrissae, the lobular cartilage baffles, and the upper lateral cartilage valves. Actually, the external nasal pyramid is an attic to the internal nasal mansion, and the anterior-superior border (dorsum) is its roof or tegmen (Fig. 3). The roof consists of, from within outward, the nasal mucosa covered by bone or cartilage or both, which in turn are covered by periosteum and/or perichondrium, then by the deep layer of the superficial fascia, the loose subcutaneous tissue, and, finally, by the total skin. In effect, the nasal mucosa of the external nose is covered by a many-layered insulating roof.

The whole pyramid has several functions. It plays a role in modifying and controlling the shape, course, pressure, velocities, and whirls of the air currents, and, I believe, serves as a tempering chamber, modifying the temperature of the inspired air before it enters the nasal chambers. Also it acts as a buffer to the air currents on expiration, holding back not only the air stream but also the moisture and warmth brought up from the lower respiratory tract. To subserve these functions most efficiently, an insulated roof to the external nose is essential.

If one accepts this physiological concept, he finds the words "hump removal" full of misleading connotations; to remove a hump would immediately mean the removal of part of the function of the external pyramid. One would feel constrained to think in terms of eliminating an undesirable cosmetic effect without impairing the function. The surgical objective would be to eliminate the hump but still retain, restore, or repair the anatomical and physiological integrity of the nasal roof.

For this objective there are the following possibilities:

1. Remove the hump by the method of Joseph. In healing an adequate roof may be restored without additional surgery. Especially is this so if the bony elements of the nasal arch are pressed together, as occurs if a Kazanjian forceps is utilized for the removal.
2. Eliminate the hump without removal of any tissue.
3. Remove the hump and replace it as a graft after trimming or otherwise modifying it.
4. Remove the hump and substitute an autogenous bone graft or cartilage graft.
5. Remove the hump and substitute isogenous bone or cartilage, or animal cartilage.
6. Remove most of the hump and grid the remaining bone and cartilage to fill in the defect created.
7. Combine any of the methods mentioned as may be indicated.

Nearly always the modification of the anterior border of the nose requires a narrowing of the pyramid to bring the lateral laminae together to form a new normal looking and acting nasal arch. This necessitates the separation of the ascending processes of the superior maxilla from the rest of the bones to permit this mobilization. These freely movable pieces must be held in place, and this is best accomplished by preserving the underlying mucosa or the overlying periosteum or both.

I have found the combined use of the saw and the curved and straight 7-mm. chisels to be the most precise method for performing this procedure, called the lateral osteotomy. The separation of one nasal bone from the other or each nasal bone from the septum is necessary before doing lateral osteotomies, to avoid cross splintering of the bones. Not too rarely a beginner has the unfortunate experience of losing a nasal bone, more correctly the "bony lamina," since it is made up of part of the nasal bone and part of the ascending process of the superior maxilla. An internal splinting with ½ in. (1 cm.) gauze strips is of great value in controlling the movements of the mobilized nasal bony arch and preventing this complication.

The moving of large lateral pieces is easier than moving small ones; this fact emphasizes the advantage of trying to remove the dorsum of the nose after mobilization of the pyramid rather than before, as was taught by Joseph, and which is the method still most commonly used. If one wishes to modify the tegmen of a movable pyramid, he is forced to forsake the use of the chisel or saw for removing the hump. The use of these two instruments is possible only when the bony pyramid is immobile, offering fixed resistance to the instruments.

After a total hump removal following the Joseph technique, it is most often very feasible to trim the hump removed to a thin layer and replace it over the opened nasal chambers, thus restoring the hard portion of the insulation, which prevents the nasal mucosa from coming or growing into direct contact with the subcutaneous tissue or the skin itself. If the hump material removed cannot be replaced, cancellous bone from the iliac crest is the substitute material of choice. Autogenous cartilage from the septum, ear, or rib is not as good but may be fairly adequate. Preserved bone or preserved animal or human cartilage can serve a temporizing purpose, as they will most probably be replaced by new fibrous tissue in sufficient amount to make a fairly effective insulator.

Gridding of the hump bone and cartilage with Kazanjian, Dufourmentel, or Lempert rongeurs creates small pieces of bone and cartilage, which may or may not remain attached to soft tissues, and they may be moved around enough to eliminate the "humping." Later they are joined together sufficiently by scar tissue to establish a very desirable nasal tegmen. In most instances in which this method may be attempted, some of the hump, in fact much of it, may have to be removed and the remainder gridded to fill in the defects. The bridge of the nose at the nasion frequently

Fig. 4.—Eliminating hump by infracture and "push down" of lateral laminae and intact nasal roof.

needs similar handling, and this is most effectively done with straight chisels and bone rongeurs.

To eliminate the hump without any removal of the roof tissues entails a mobilization of the whole nasal pyramid and the pushing down of the pyramid into the nose (Fig. 4). The septum, of course, must permit this.

The concept for this surgical correction of the hump comes from observations of recent nasal fractures. Practically every such fracture has a downward displacement factor in addition to a lateral one. In some the external force has pushed the external nasal pyramid into the internal nose and caused fractures, dislocations, and subluxations of the nasal septum as well as of the nasal bones.

To clarify the application of this principle, the procedure will be described as might be done in a patient with a moderate-sized hump associated with an obstructing or impacting deviation of the septum.

1. After a right hemitransfixion (as previously described),[2] both mucosal flaps would be raised and the necessary corrections of the septum done through the septal space. The nasal bones would be separated from each other or from the septum on one or both sides. This would be done intraseptally without cutting through

the nasal mucous membrane and without cutting through the cartilaginous vault. If the previous septal corrections did not already allow enough moving of the dorsum, a strip of septal cartilage and bone, corresponding roughly to the desired lowering of the nasal roof, would be removed, usually from the anterior border.

2. Next, lateral osteotomies underneath the periosteum, either through alar incisions or vestibular incisions, would be performed, and oil-soaked ½ in. (1 cm.) gauze strips would be placed into the nose as a supporting scaffolding for the bony arch.

3. Infracture of the lateral laminae would be done.

4. The total bony vault would be mobilized and pushed downward into the nose —a downfracture.

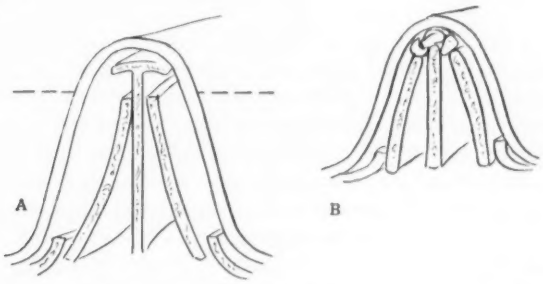

Fig. 5.—*A*, roof trimmed at level of dotted line after infracture and downfracture of lateral laminae; *B*, slivers of cartilage and bone restore roof.

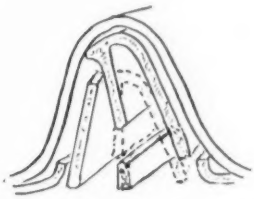

Fig. 6.—Septum, roof, and one lamina rotated inward and downward after separation of one nasal bone.

This eliminates the hump; the cartilage vault remains intact. There would be practically no trauma to the subcutaneous tissues, the nose would be narrower, and the roof remain an unimpaired insulating organ.

There are many variations that immediately suggest themselves:

1. In the event that the septal operation has previously been done, the removal of a septum strip would be unnecessary.

2. If the septum requires no surgery and has not previously been done, a strip of the whole septum may be removed immediately posterior to the roof via the nasal chambers instead of through the septal space.

3. The roof can be separated from both nasal bones, and lateral laminae thus created may be infractured and then downfractured, and the protruding remaining septum and roof trimmed after the skin and subcutaneous tissues have been elevated (Fig. 5).

4. The roof and one nasal bone may be separated from the other nasal bone, mobilized downward, and rotated: a modification most valuable, especially in old fractures in which the nose is displaced markedly to one side. Part of the septum may be retained attached to the roof, and the rotation may place it into a proper sagittal position, thus making its removal unnecessary (Fig. 6).

The amount of lowering of the nasal roof that can be done depends chiefly on the nasal septum, the width of the nose, and the location of the lateral osteotomy cuts. If the lateral osteotomies are placed too far posteriorly, the turbinates will impede a considerable downward displacement. If they are placed more anteriorly in a wide nose, a greater posterior displacement is possible, and, with the preservation of the subcutaneous tissues, the production of an undesirable step effect is not to be expected.

SUMMARY

The external nasal pyramid serves as an attic protecting the nasal chambers. The dorsum is its roof and is normally an efficient multilayered insulating structure. It is believed that surgery of the roof should have as one of its objectives the restoration of its structure, thereby insuring the preservation of its function. Methods of repairing the roof after surgery or injury are presented. Methods of lowering the roof into the nose are offered as substitutes for the removal and disposal of the hump, when feasible. The relation of the septum to this whole problem stresses the importance of the rhinologist to concern himself with all the problems of the external nasal pyramid.

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PREVENTION AND CORRECTION OF CICATRICIAL INTRANASAL ADHESIONS IN RHINOPLASTIC SURGERY

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THE NASAL VESTIBULE

PRACTICALLY all rhinoplastic maneuvers are performed through the intranasal route by incisions made in the nasal vestibule. The latter forms a dilatation inside the aperture of the nostril. It is bound laterally by the ala and the lateral crus of the alar cartilage and medially by the columella and the membranous septum. The vestibule extends from the nares to the intercartilaginous fold, which separates the alar and lateral cartilages. In a frontal section each vestibule has the approximate shape of a right-angle triangle, with the lateral wall of the nostril forming the hypotenuse. The concavity of the lateral crus and its junction with the medial crus form the high vault of the vestibule. This vault makes the diameter of the vestibule larger than the diameter of the nostril. The lining of the vestibule consists of a thin layer of the skin intimately adherent to the underlying cartilage. Posterior to the intercartilaginous fold the lateral cartilage is lined with mucous membrane.

PREVENTION OF ADHESIONS

Within this small space several incisions are customarily made in the course of a routine corrective rhinoplasty. An incision along the intercartilaginous fold is used to skeletonize the nasal dorsum. Posteriorly the lateral cartilages are detached from the septum. They are trimmed only as far as it is necessary to adjust them to the changed contour of the nose. A strip is excised along the septal border to correlate it with the reduced height of the septum. The anterior tip of the lateral cartilage is excised to synchronize it with the shortening of the septum. Since only the excess of lateral cartilage is sacrificed, the underlying mucous membrane is excised with it. Such an incision should not leave a gap between the lateral and alar cartilages, but the two should remain in close approximation.

A small stab incision at the junction of the lateral wall and the floor is employed to gain access to the frontal process of the maxilla preparatory to osteotomy.

The reshaping of the nasal tip, ordinarily an integral part of the corrective rhinoplasty, calls for adequate exposure and adjustment of the alar cartilages. This necessitates a marginal incision along the free border of the nostril and wide undermining of the alar cartilages. Most surgeons [1] prefer to divide the alar cartilages by means of a longitudinal incision into a lateral and medial .us. This permits easy delivery of the fragments and facilitates their reshaping. There is seldom any indication for sacrificing even the smallest amount of the alar lining. When fragments of cartilage are excised, the lining is carefully dissected and preserved. Any excess of the alar lining will usually shrink and accommodate itself to the changed shape of the nostril.

Alar flaps, when deprived of fragments of cartilages, may curl and will need to be carefully flattened before they are returned to their normal position. When this is done, the vestibule must be fully lined, and a normal vestibular vault should be present. Furthermore, provision must be made to maintain the alar flaps in their position during the healing period, to avoid the possibility of accidental displacement.

The intranasal packing, customarily used after the operation, maintains the alar flaps in close contact with the vestibular vault. Such packing can be compared to a pressure dressing used in general plastic surgery. It keeps the undermined surfaces obliterated and the dissected parts splinted, thus minimizing fibrosis and promoting

Fig. 1.—One suture holds the medial and lateral alar flaps. Another suture anchors the lateral flap along the margin of the nostril.

healing. Changing the packing or any other manipulation is unnecessary and inadvisable until the packing can be discarded. The removal must be done carefully, since the packing may adhere to the lining flaps and dislodge them.

For the purpose of securing the alar flaps in their exact position, packing alone was not found to be completely reliable. Occasional displacement of the alar flaps was observed until suturing of the flaps became a routine procedure. Since then, overlapping of the borders of the marginal incision or appearance of granulation tissue in the vestibule has not been encountered. Only two sutures are needed: one around the free margin of the nostril and the other between the medial and lateral crus (Fig. 1).

In order to eliminate any possibility of displacement of the alar flaps and to avoid the marginal incision, it has been suggested that the alar cartilages be exposed by the eversion technique.[2] The flaps then are firmly attached, not only laterally but also anteriorly. However, this technique makes the adequate reshaping of the alar cartilages much more difficult. The surgeon may have the benefit of an adequate exposure, which facilitates this phase of the rhinoplasty, and still be assured of smooth postoperative healing if the simple precautions mentioned above are followed.

Any raw surface left in the vestibule will heal by cicatrization. The healing of intranasal defects is extraordinarily rapid but results in contracture of the surrounding tissues and formation of cicatricial bands and adhesions. This may lead to external indentations, puckering, and retractions around the nasal tip and the nostrils. These flaws are not apparent during the operation but develop during the postoperative period. The so-called "pinched-in" tip is a typical example of symmetrical contractures resulting from the sacrifice of the alar lining.

The common site for vestibular adhesions is the vestibular vault alongside the septum. They may extend anteriorly and posteriorly along the marginal and intercartilaginous incisions. The cicatricial adhesions in the vestibule may encroach upon the breathing channel to such a degree that a noticeable respiratory impairment is reported by the patient.

CORRECTION OF ADHESIONS

When vestibular adhesions and nasal obstruction are sufficiently pronounced to cause the patient discomfort and/or to affect the contour of the nose, surgical correction is indicated. Mere division of adhesions and reliance on packing or rigid splints to prevent them from recurring should be mentioned only to be condemned. More scar tissue and more contracture are likely to result from such an attempt.

The first step of such a correction consists in complete excision of the existing intranasal scar. The surrounding tissues must be sufficiently dissected and freed from fibrous adhesions to allow them to retract to their normal position. When this is accomplished, the contour of the vestibular cavity is restored and the external irregularities are eliminated. The resulting raw surface must then be covered with an adequate epithelial substitute in order to prevent the recurrence of the contracture.

Skin grafts in the nasal cavity are considered objectionable because of their dryness and tendency toward crusting. This objection does not apply to the skin grafts in the vestibular cavity, since there they replace not the mucous membrane but skin. The textbook technique for cavity grafting is known as "epithelial inlay," or "Esser inlay," which utilizes a rigid mold or stent for introduction of the skin graft.[3] The skin graft recommended for an epithelial inlay is a split-skin or Thiersch, graft. It has frequently been stated that only these grafts can be assured of a certain "take" in body cavities, be it in the mouth, nose, or the orbit, where contact with secretion and contamination cannot be avoided.

There is no doubt that split-skin grafts may be expected to take well in the most unfavorable circumstances. However, they have the very substantial disadvantage of postoperative shrinkage. This continues for several weeks after a successful take and may amount to more than 50%. Therefore the recommended techniques call for maintenance of rigid molds for several months after the operation to minimize this shrinkage. Keeping rigid molds (plastic or hard rubber) in the nasal cavity for

several weeks after the operation is a source of great annoyance to the patient. Moreover, often even these splints do not prevent at least partial recurrence of the original condition.

The skin graft which shows the minimum tendency to contract is the full-thickness graft. Such grafts taken from the trunk are thick and unyielding, difficult to manipulate in the small limited space of the nasal vestibule, and their "take" is very uncertain. However, full-thickness grafts of thin selected skin, like that found on the eyelids, behind the ear, or above the clavicle, have all the advantages of the full-thickness skin graft and at the same time have an amazing certainty of success. They are used extensively in plastic surgery for resurfacing cutaneous defects of the face. When used on lips, around the mouth, around the nostrils, and around the orbital cavity, they unavoidably come into contact with secretion from these cavities. Extensive experience has shown that they are not affected by such contamination.

For resurfacing of limited areas within the nasal vestibule, the postauricular donor area offers particular advantage, since the skin graft is large enough for unilateral or bilateral correction, and the resulting scar is concealed.

The original technique of an epithelial inlay calls for making a mold of the cavity out of softened dental compound. After the mold hardens, the graft is wrapped around it, raw surfaces outward, and is inserted into the cavity. The rigid mold keeps the graft in close approximation to the raw surfaces and at the same time distends the cavity, thus overcorrecting the raw area and allowing the insertion of the maximum amount of skin. Such a precaution is quite essential in view of the anticipated late contracture of the graft. This technique as applied to the vestibular cavity is very tedious and unsatisfactory. The area to be resurfaced is primarily located along the vestibular vault in a recess within the concavity of the alar cartilage. As mentioned before, the diameter of the vestibular cavity is larger than that of the nares, and so preparation of a mold sufficiently large to fill out the vestibular dome and be inserted through the nares is hardly feasible. To insert and maintain a skin graft in a vestibular recess by means of a packing alone is even more tedious and unsatisfactory.

In general plastic surgery, for resurfacing eyelids, neck, axilla, etc., the use of rigid stents of dental compound has been abandoned in favor of simpler techniques. Sutures inserted along the edges of the graft are tied over a bolus dressing and the skin graft stretched, thus allowing for overcorrection. The bolus dressing also keeps the graft in intimate contact with the underlying tissues and supplies the necessary pressure. Insertion of sutures inside the vestibule offers no difficulty. The details of this procedure are described in the following case presentation and in Figures 2, 3, and 4.

REPORT OF A CASE

The patient was a young woman, examined by me in the summer of 1952. A few months previously she had undergone corrective rhinoplasty, which was evidently followed by complications. She stated that the surgeon had to make some adjustments during the first few days after the operation. She was dissatisfied with the operative result mainly because of irregularities and indentations around the nasal tip and retraction of the nostril. Her main complaint was difficulty in nasal breathing, which developed after the operation.

Examination showed both nostrils acutely retracted near the junction with the columella, forming a groove across the brim of the nostrils. Deep identations were present on both sides

of the nasal tip (Fig. 2). Anterior rhinoscopy showed a narrowing of the vestibulum to a round air space and a heavy cicatricial web occupying the entire vault of the vestibulum. The scarring extended along the margin of the nostril. The intranasal contracture was more pronounced on the left side than on the right.

Patient was operated on with local anesthesia. The scar inside the nostril was completely excised. The remaining alar cartilages were undermined sufficiently to allow them to retract

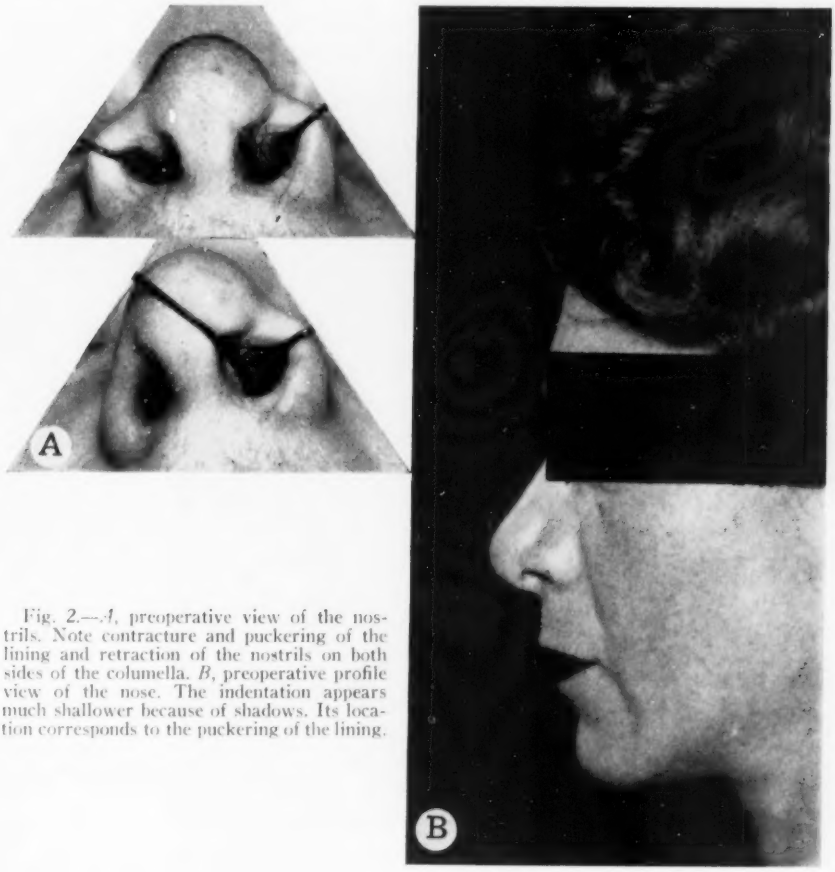

Fig. 2.—*A*, preoperative view of the nostrils. Note contracture and puckering of the lining and retraction of the nostrils on both sides of the columella. *B*, preoperative profile view of the nose. The indentation appears much shallower because of shadows. Its location corresponds to the puckering of the lining.

into a normal relaxed position. This required considerable sharp dissection and increased the remaining defect still further.

The anterior border of the nostril was freed until all the cicatricial rigidity was eliminated and the margin of the nostril could be distended freely. The dissection improved the outline and symmetry of both nostrils and corrected the indentations. To make sure that the lining flaps would lie in complete apposition to the tegumental surface, thus limiting postoperative fibrosis, a mattress suture was passed through the whole thickness of the nostril and tied on the outside over bits of gauze. The estimated linear width of the concave defect in the vault of the vestibulum was about 2 cm. The same procedure was carried out on both sides.

A skin graft was dissected from the left postauricular region in routine manner. The graft measured 2.5 by 5.5 cm. After slight undermining of the skin edges, the defect was closed by

approximation without changing the position of the auricle. The graft was divided in two, one fragment to be used in each nostril. The skin graft was placed in front of the nostril in the position it was going to take intranasally. A mattress suture was passed through the posterior border. This suture was double-armed with short, straight needles, which were inserted intranasally along the posterior border of the defect and passed on the nasal bridge. Along the anterior border of the graft, two single sutures were inserted. With the help of the mattress suture, the graft was then pulled into the nostril, and the two anterior sutures were anchored along the margin of the nostril. Sutures were then placed on the medial and lateral sides of the defect. The graft fitted quite loosely. A small bolus of bismuth tribromphenate (Xeroform) gauze was then placed over the graft and the sutures tied over the bolus. A short, small rubber

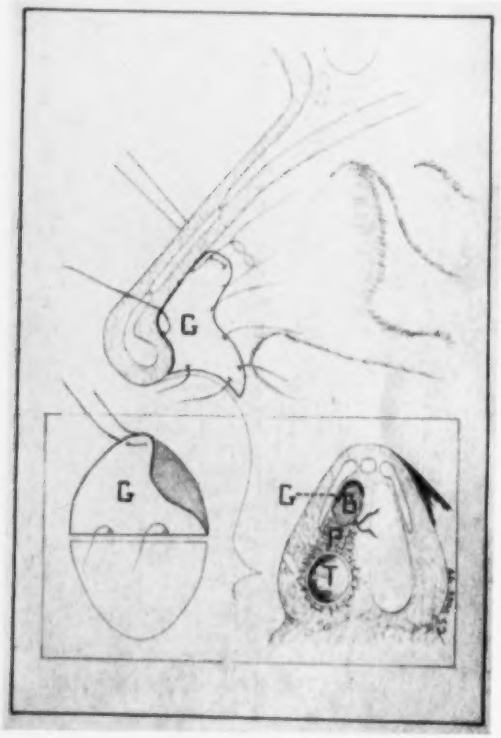

Fig. 3.—*A*, lateral wall and roof of the vestibule viewed from inside. The vault is lined with the skin graft. The long sutures are ready to be tied over a bolus. *B*, half of the skin graft is trimmed and ready to be inserted into the nostril. The double-armed suture anchors the posterior edge. The two interrupted sutures fix the anterior border of the graft to the margin of the nostril. *C*, frontal section of the vestibule showing the dressing. Bolus is tied over the graft and a rubber breathing tube inserted into the nostril. Between them the iodoform packing fills out and distends the nostril.

tube (No. 16) was inserted into the vestibulum, and iodoform packing was placed around it, reinforcing the dressing around the graft and distending the nostril (Fig. 3). Patient could breathe freely through the rubber tube. The same procedure was carried out on each side. An external lead splint was applied, such as is employed in routine corrective rhinoplasty.

The suture tied on the skin surface was removed on the third day. The intranasal tube was discarded at the end of the week, but the complete dressing was not done until the 10th day,

when the intranasal sutures and the bolus were removed. The grafts took completely. As an additional precaution, plastic nasal dilators, No. 5, were recommended to be worn at night. Possibly this precaution was superfluous, but, since some shrinkage of the graft was expected, it seemed advisable to keep the nostrils dilated for a time every day. The dilators were discontinued in four weeks.

During the ensuing months some contracture of the graft did take place but not enough to influence the nasal contour or to cause any impairment in breathing. On intranasal examination, the vestibular cavity looked smooth and normal in shape. The external contour of the nose was greatly improved, as seen in Figure 4.

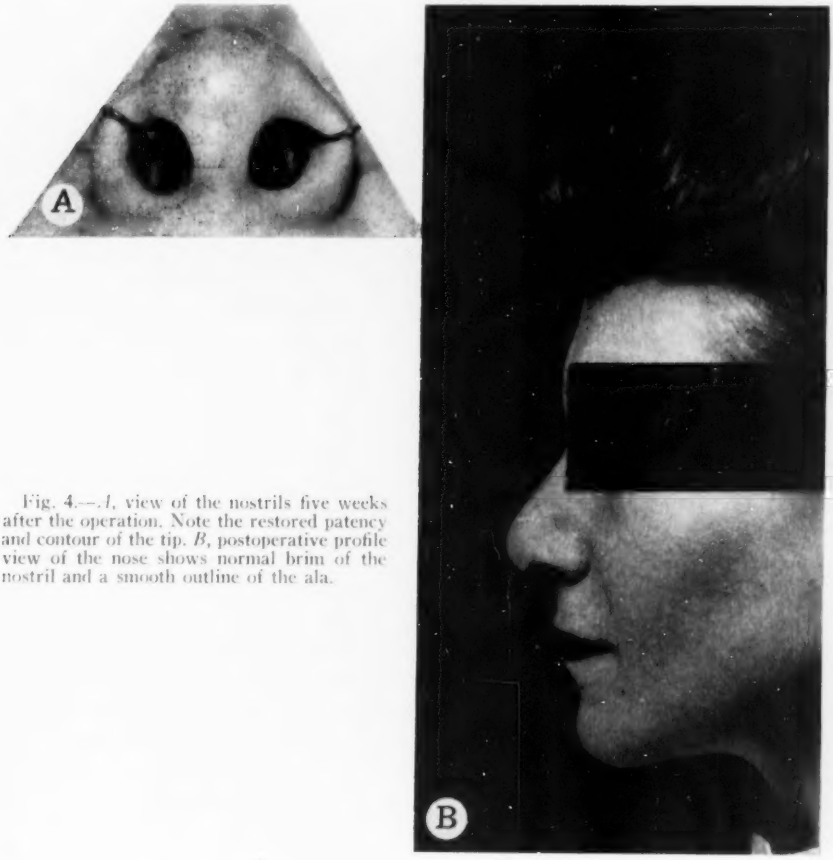

Fig. 4.—*A*, view of the nostrils five weeks after the operation. Note the restored patency and contour of the tip. *B*, postoperative profile view of the nose shows normal brim of the nostril and a smooth outline of the ala.

SUMMARY

Precautions for avoiding intranasal vestibular contractures and adhesions following corrective rhinoplasty have been discussed. The essential point is that no raw surface must remain intranasally after completion of the operation. Practically all the linings should be preserved, and the lining flaps should be securely fixed in their positions at the end of the procedure.

Existing vestibular adhesions which cause contraction of the nostril, puckering, indentations around the nasal tip, and similar defects and are responsible for impairment of nasal breathing must be surgically corrected. Principles of such correction are complete excision of the scar tissue, undermining of the surrounding structures to allow them to retract into their normal positions, and resurfacing of the remaining defect with a skin graft which has a minimum tendency to contract. A simplified technique is presented. The use of full-thickness skin grafts, preferably of postauricular origin, is recommended. An illustrative case is described.

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COMPLICATIONS OF TONSILLECTOMY

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ADENOTONSILLECTOMY is a major surgical procedure accompanied with a varied percentage of mortality, morbidity, and complications. Too great hazards of tonsillectomy lessen its advisability, and there is need for positive "indications for surgery."

NEED FOR TONSILLECTOMY

The advisability and need for tonsillectomy deserve serious consideration. Lymphatic tissues are a barrier to infection, with phagocytic and autoimmunization functions, and their removal is needed only when they become diseased and a threat to good health. Fairly acceptable indications include the following: (1) obstructions from hypertrophy—causing obstructed nasal breathing, altered voice, snoring, difficult mouth breathing and swallowing, and blocked Eustachian tubes with conductive deafness and retardation in school; (2) chronic tonsillitis—following recurrent acute attacks, regional lymphadenitis, and quinsy; (3) chronic bacterial otitis media, nasosinusitis, and tracheobronchitis; (4) diphtheria and the carrier state for pathogenic streptococci; (5) some neoplasms within the lymphoid tissue; (6) pathologic tonsils associated with evidence of systemic ill effects.[15] Crypts are frequently occluded by swelling, cicatrices, purulent and caseous accumulations with fetid odors, inclusion cysts, granulomas, papillomas, and tonsilloliths which entrap infections. These can cause abscesses and ulcerations with many surrounding capillary thrombi, which are readily dislodged into the system by the compression of throat movements. Thus, bacteria, toxins, and acquired bacterial allergens can reach the circulation. Bad tonsils are a possible factor in unexplained anorexia, malnutrition, growing pains, retarded mentality, and certain secondary anemias. There is a rather close causal relationship with bacteremias, rheumatic fever, endocarditis, infectious arthritis, and some nephritides. Bad tonsils may also be one factor in degenerative cardiovascular diseases,[16] iritis, pyelitis, prostatitis, osteomyelitis, thrombophlebitis, etc. There are infectious types of asthma and eczema resulting from bacterial allergens. When a complete examination has eliminated the other causes of such systemic diseases and the symptoms are clearly referable to the tonsils, their removal becomes a duty, provided the risks are minimal.

RISKS AND POSSIBLE COMPLICATIONS

Possible complications (some serious) are favored by the unique location of the tonsils.

1. In the respiratory tract: aspiration, atelectasis, pulmonitis, lung abscess, and foreign body may occur in the lungs. (Loose teeth, broken instruments, detached sponges and lymphoid tissue, oral secretions, caseous plugs, blood, vomitus, etc., can be aspirated.)

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2. In the alimentary tract: exposure to infection. Food ingested is not sterile.

3. Continuity of mucosa to ears, sinuses, and lungs: ready spread of acute infections. It is safest to have no acute or pyogenic infections in the patient's family or operative and attendant staff. At least two or three weeks after acute infections have completely subsided should be allowed for development of active immunity.

4. Adjacent to the "death zone," the *X*-point of crossing of the respiratory and digestive tracts (between the base of the tongue and the rima glottis). Obstruction here causes suffocation. Impaction of tongue, epiglottis, and vomitus is conducive to asphyxia (especially in intravaneous narcosis). In such instances, either operatively or postoperatively, immediate freeing of the airway is essential.

5. Adjacent to parapharyngeal spaces: possible cellulitis, parapharyngeal infections, lymphadenitis, thrombosis, cervical phlegmons, mediastinal abscess, erosions of vessels with profuse hemorrhages, septicemias, brain abscess, etc.

6. In a muscular mobile area: mobility favors dislodgment of ligatures, coagulums, crusts, and vascular thrombi, which may lead to a bacteremia or emboli. Neck movements, hawking, coughing, vomiting, thumbsucking, smoking, and the sucking action of the pharynx and palate in deglutition are conducive to bleeding. Swallowing conceals hemorrhage. Nevertheless, encouragement of eating is essential for healing.

7. In a vascular area: (*a*) The external carotid has four main branches to the tonsils, arising at or just above the bifurcation; (1) the ascending pharyngeal from the carotid bifurcation, running in the lateral pharyngeal wall to the adenoids, with a palatine branch to the tonsils; (2) the internal maxillary, giving descending palatine branches to the upper pole; (3) the lingual and external maxillary giving tonsillar and ascending palatine branches to the base and middle of the fossa.

(*b*) The internal cartoid is rarely anomalous and tortuous and rarely less than 0.5 cm. from the tonsillar fossae; it has no branches in the neck or to the tonsils.

(*c*) The venous plexuses empty into the internal jugular.

REPORT OF COMPLICATIONS

In 1922, Loeb [1] collected reports of 109 nonanesthetic deaths from tonsillectomy, listing the causes of death as hemorrhage, sepsis, cavernous sinus thrombosis, and respiratory infections.[4] The United States Bureaus of Census lists 942 anesthetic deaths during tonsillectomies in the decade from 1922-1931 (Bishop [2]); this was 15% of all anesthetic deaths. The United States Vital Statistics Record for 1949 lists 43 deaths from "therapeutic misadventure in anesthesia." Baron,[3] in 1951, collected 337 reports of laryngeal trauma from endotracheal anesthesia. These included edemas, ecchymoses, exudative membranes, abscesses, granulomas, cicatrical webs, and respiratory obstructions resulting in 47 tracheotomies and 14 fatalities. An aspirated tooth resulted in a lung abscess and a lawsuit in Dallas, Texas; the aspiration of an overlooked tonsil sponge caused a death in Canada in 1950. Parkinson [6] mentions knowledge of the suffocation of a Chinese child from the aspiration of sticky rice. Sweet [5] reported 54 lung ascesses in the Massachusetts General Hospital during the four years from 1933 to 1937; Williams [17] found reports of 10 cases of septicemia; Harlowe,[7] in 1948, collected reports of 3 deaths from pneumonia,

202 lung abscesses, 125 deep cervical infections with 25 fatalities, 16 fatal intracranial complications, 43 deaths from drug idiosyncrasy, and 89 fatal hemorrhages—all complicating tonsillectomies.

Tonsil hemorrhages are usually considered as 4 to 8% in the United States (Adin *). Various percentages reported are those of Wright,[10] 17.4 to 1.5; Fox,[11] 9.9 to 1.3; Pearlman,[12] 5 to 10; Hans Key-Alberg, in Sweden,[13] 1.9, and in Denmark "after-bleedings are close to 11%."

ROSS-LOOS EXPERIENCE

The Ross-Loos Medical Group in Los Angeles has performed more than 28,000 tonsillectomies since the Group was organized, in April, 1929. There has been no mortality and no cardiac arrest, and relatively few complications have occurred.

The complications (with undesirable morbidity) that occurred among 9,518 tonsillectomies of the years 1946-1953 are as follows:

Tonsillar and Adenoid Hemorrhage in Sixty-Three Hospitalized Patients

Type of Bleeding	Patients, No.
Tonsillar	25
Adenoid	38
Total	63
Primary (1st day)	23
Secondary (2 to 10 days)	40
Total	63
Hgb. 70-80% *	27
Hgb. 60-70%	21
Hgb. 50-60%	12
Hgb. 40-50%	3
Total	63

* The decrease in the red blood cell count corresponded with the decrease in hemoglobin concentration. Transfusions were given to 12 patients, plasma to 3.

1. Mumps on the second day after surgery, one case. Postoperative recovery occurred, and the mumps ran an uncomplicated course.

2. Measles on the third day after surgery, two cases. The throats healed within 12 days, and the measles were uncomplicated in either case.

3. Chicken pox on the second day after surgery, one case. Uneventful recovery.

4. Retropharyngeal abscess on the sixth day after surgery, one case. Subsided with sulfadiazine saturation.

5. Parapharyngeal abscess with severe cervical phlegmon on the third day after surgery, two cases. Recovered after incision and drainage and antibiotics.

6. Otitis media, three cases. Myringotomies and antibiotics were used, and no mastoiditis developed.

7. Lung abscess, one case. Recovery followed the use of antibiotics alone.

8. Drug reactions, 11 cases. (*a*) Procaine: immediate cyanosis, convulsions, coma, bradycardia, with threatened cardiac and respiratory arrest, probable cerebral angiospasm (three cases). Reclining position and oxygen-carbon dioxide mixture (Carbogen) inhalation seemed to help.

* References 8 and 9.

(*b*) Epinephrine: within two hours, severe edema of palate, pharynx, and neck, with supraglottic edema and threatened asphyxia (two cases). At the time of the anaphylactic reactions they were considered as probable procaine reactions and treated with oxygen inhalations and epinephrine injections; later sensitivity tests showed marked reactions to epinephrine but no sensitivity to procaine.

(*c*) Divinyl oxide (Vinethene) and ether: sudden and alarming cyanotic convulsions relieved by cessation of anesthetic, freeing airway, artificial respiration, oxygen, manual pressure on gas bag for lung inflation, and small amount of intravenous thiopental (Pentothal) sodium (six cases).

9. Overlooked postnasal packs causing fetid odor, two cases. The malodor disappeared after removal of the packs. At present all sponges are string-attached.

10. Swallowed sponge, one case. No sequelae developed.

11. Hemorrhages hospitalized, 63 cases. The extent of the bleeding of the 63 hospitalized patients is shown in the Table.

Secondary adenoid bleedings were the most frequent, and (being partly concealed by swallowing) resulted in very low hemoglobin concentrations of 43% on the fifth, 42% on the sixth, and 47% on the eighth day postoperatively.

The percentage of patients hospitalized for bleedings out of the total number of tonsillectomies is 0.66%. Other minor hemorrhages were treated in the homes and offices.

COMMENT

It is believed that this experience of no mortality and few complications has resulted from the procedures and facilities of the Ross-Loos Medical Group. The surgery is performed by highly trained personnel, otolaryngologists and anesthetists having Board recognition. The surgical and recovery rooms, being located in the physicians' office building, offer immediate surgical and medical attention for complications, and the physicians' services are available 24 hours every day. Precautions that govern other major surgical procedures are followed: thorough pre-operative examinations, safe anesthesia with good relaxation, careful surgery with gentleness in handling tissues, meticulous hemostasis, constant observation until recovery, and postoperative care. Preoperative examinations required are a general physical examination, bleeding and clotting times, and a chest x-ray. Thymic enlargements are treated with x-ray before surgery. During epidemics of virus influenza and poliomyelitis, elective surgeries were canceled, and no case of poliomyelitis has complicated these tonsillectomies. Preoperative checks are made by the "tonsil nurse," anesthetist, internist, and surgeon on the morning of surgery, and when contraindications are found surgery is deferred. Ether is considered the safest anesthetic for maintenance when routinely preceded by atropine; induction is better from mild sedation, nitrous oxide gas being used for adolescents and divinyl oxide for children. At surgery, bleeding vessels are picked up and tied and a dry field is obtained before surgery is complete, and the fossae and adenoid areas are examined. A recovery nurse is in constant attendance. Inspection is again made before the patient goes home and written instructions are given with medications. Antibiotics have not been used routinely owing to the frequent allergic and anaphylactic reactions which follow their use, but they are useful in preventing flare-ups of an

endocarditis or arthritis and are advisable in every case of heart murmur in which no sensitivity to the antibiotic exists. The operating set-up is as good as that of hospitals for major surgery, and safety equipment for possible emergencies includes the following: (1) tongue-grasping forceps; (2) pharyngeal airways; (3) tracheal airways of various sizes; (4) life-saver tubes; (5) direct laryngoscopes, some battery-lighted for quick availability; (6) tracheobronchial aspirating catheters; (7) full bronchoscopic set for all ages; (8) tracheotomy set with large and small tubes; (9) oxygen, oxygen-carbon dioxide mixture, and helium; (10) pressure machines for lung inflations, respirator, and pulmotor; (11) operating set for ligating carotid; (12) operating set for cardiac massage; (13) intravenous saline solution, dextrose, plasma, and blood; (14) useful drugs immediately available are epinephrine, nikethamide (coramine), ephedrine, camphor oil, caffeine and sodium benzoate, phenylephrine (Neo-Synephrin) hydrochloride, digitalis (Digifortis), lobeline, picrotoxin, sedatives, coagulants, and astringents (Monsel's, tannic acid, hydrogen peroxide, oxalic acid, thromboplastin, Koagamin).

PRECAUTIONS

Of precautionary measures, the preoperative studies are of great importance. Preoperative recognition of all circulatory, pulmonary, renal, hemic, allergic, neurological, and other systemic and local diseases is one of the greatest safety factors. Contraindications to tonsillectomy include hemophilia, leukemia, blood dyscrasias, Hodgkin's disease, acute phases of pernicious anemia, active tuberculosis, carcinoma, acute infections, acute allergy attacks, and other diseases with surgical risk. Psychological preparation and consideration of psychic trauma lessen later emotional conflicts. Written instructions are given regarding diet, fluids, and preoperative and postoperative care. The diet following surgery is bland for comfort, full and nutritious for healing, avoiding only highly acid, highly seasoned, and coarse foods. Nearly all foods can be prepared in a soft manner and should be taken up to the patient's tolerance; especially welcome are ice creams, candies (marshmallows have gelatin), custards, soft vegetables and fruits, and ground meats. Curtailment of the diet, especially fluids, can cause dehydration, starvation, acidosis and vomiting, pyrexia, loss of weight, and poor healing. In such instances, intravenous dextrose is beneficial. Coaxing to eat is important in healing.

Vitamin C is given for 10 days, beginning 2 days before surgery, and vitamin K given for the same period is valuable in the hypoprothrombinemia of liver insufficiency or if the patient uses acetylsalicylic acid (Aspirin) unadvisedly. Avoidance of acetylsalicylic acid tablets and gum has lessened secondary bleedings clinically. At surgery, loose teeth are extracted to prevent their aspiration. The airways are kept open during induction, maintenance, and recovery, and cyanosis avoided. Serious aspiration has been averted by suction, sponging, thorough hemostasis, and use of the modified Trendelenburg or Rose positions and the Sims position for recovery. Profound prolonged sedation and anesthesia with uncontrolled bleeding predispose to aspiration. Keeping the hypopharynx constantly free of all secretions and foreign substances prevents aspiration. Flagg † believes that improved techniques to avoid trauma in intratracheal anesthesia is the most certain method of preventing aspira-

† Flagg, P. J., cited by Baron and Kohlmoos.[3]

tion, anoxia, and atelectasis. The risk is greater in children with small laryngotracheal lumens. Greater attention to the bleeding problem is shown by the following record: 1934—899 tonsillectomies with 50 primary hemorrhages; 1953—1,011 tonsillectomies with 5 moderate primary bleedings and 6 secondary bleedings. Other sequelae should not occur in tonsillectomy, namely, the following:

(*a*) Injury to the teeth, tongue, uvula, palate, or pillars and tori; to an elongated styloid process protruding into the tonsil fossa; to a hard and prominent tubercle of the atlas in the nasopharynx; or to the glossopharyngeal (ninth) nerve as it passes downward through the base of fossa (with resulting taste disturbances on the posterior half of the tongue).

(*b*) Tonsil tags: these are usually tonsil knobs protruding outward from the capsule, visible follicles in the pillars, or paralingual follicles in the plica triangularis at the base of the fossae (which are drawn upward into the fossa by contracting scar tissue). On the other hand, the lingual dissection carried too far onto the base of the tongue heals with synechia of tongue and fossae. Tonsil tags can be classified as follows:

1. Relatively innocuous, noncryptic lymphoid follicles, as a part of a follicular or granular pharyngitis. X-ray therapy is beneficial for relief of their local symptoms; a dosage sufficient to damage the mandibular epiphyses or to produce a later carcinogenic effect should be avoided. 2. Cryptic tags, very small or large, buried beneath scar tissue are notoriously noxious as foci of systemic infections, due to pus retention in occluded crypts. Their removal (though they are small) is strongly indicated. 3. Hypertrophied lymphoid follicles on the lateral pharyngeal walls, on the tori, and in the fossae of Rosenmüller. Their removal is by direct visualization by palate retraction and punch forceps used cautiously and not too deeply, to prevent excessive scarring. Complicating conductive deafness may persist if these are not removed.

MANAGEMENT OF POSSIBLE COMPLICATIONS

Cardiac arrest (standstill and fibrillation) was reported in about 1 in 7,500 anesthesias in the University of Pennsylvania Hospital (Johnson [14]); out of 19 cases reported in seven years, resuscitation was successful in 10. Prophylaxis of such catastrophies includes a well-chosen and well-administered anesthetic, maintained arterial oxygen saturation, avoidance of cyanosis, hypoxemia, and hypercapnia by adequate ventilation, and constant watchfulness of the circulation. Alertness and instant diagnosis of arrest (the sudden cessation of heart beat and pulse beat and disappearance of blood pressure) and prompt cardiac massage are both required within four minutes, usually, to maintain life. The procedure for this is well described in detail by Johnson and Kirby.[14]

The prevention of a possible injury to an anomalous cartoid artery (usually the internal cartoid) consists in careful observation and palpation of any pulsations of the tonsil or the tonsil areas and careful dissections close to the tonsillar capsules; extra caution should be taken when the capsules have been replaced by fibrosis from previous quinsies. Such an accident might cause sudden massive hemorrhage with rapid exsanguination. Clamping and suture-ligation of the superficially placed vessel above and below its laceration might suffice. If not, firm external counterpressure against a large tonsil sponge should be maintained, with additional pressure of the

carotid against the sixth cervical vertebra, until the cartoid artery is ligated. Technique of cartoid artery ligation is as follows.

The bifurcation of the carotid is situated beneath the anterior border of the sternomastoid muscle, just above the level of the "Adam's appie." Incise along the anterior border of this muscle, 3 or 4 in. (8 or 10 cm.), beginning behind the angle of the jaw and extending to the level of the cricoid cartilage. Open skin, superficial fascia, and platysma and deep fascia into the carotid triangle. Retract sternomastoid and digastric and omohyoid muscles; open carotid sheath and separate in the carotid triangle the overlying internal jugular vein and the hypoglossal nerve and the bifurcation of the carotid artery. The internal carotid begins more externally and posteriorly and is branchless; the external carotid begins more internally and anteriorly and has multiple branches. Near its origin the superior thyroid branch, usually from the bifurcation, runs forward and downward; the ascending pharyngeal from its posterior wall runs upward; and the lingual and facial branches run forward. Ligation of the external carotid is between the superior thyroid and lingual branches and includes the ascending pharyngeal branch. The vagus nerve and sympathetic plexuses lie just posterior and between the carotid vessels and within the carotid sheath. These nerves should be avoided during ligation. To determine which vessel should be ligated, clamp first the internal, then the external, and then the common carotid arteries, to know which ligation is most effective. Free cervical and intracranial anastomoses complicate the procedure. Temporary occlusion of a carotid artery by a sponge tied over the vessel for three or four days and then released has been reported as effective with restored circulation.[6] Transfuse at once.

The methods of hemostasis used in the 63 hemorrhages that occurred were as follows:

1. Sedative: morphine, codeine, pentobarbital (Nembutal), secobarbital (Seconal), meperidine (Demerol) (41 cases)
2. Clot removal, styptics and sponge pressure: Monsel's, tannic acid, bismuth subgallate (31 cases)
3. String sponges in fossae or nasopharynx for 2 to 24 hours (25 cases)
4. Hemostatics and coagulants: thromboplastin hemostatic containing oxalic and malonic acids (Koagamin), oxalic acid, vitamin C, vitamin K, calcium, peroxide sponges, and temporary oxidized cellulose (Oxycel) packs (27 cases)
5. Ligatures, suture-ligatures, suturing of pillars, suturing of sponge in fossa (7 cases)
6. Injection of tonsil bed (procaine) (1 case)
7. Clamp (1 case)
8. Electrocoagulation; thiopental (Pentothal) sodium anesthesia (1 case)
9. Observation of dry cloths, sedatives, and coagulants (4 cases)

For tonsil bleeding operatively and during the first five to seven days postoperatively, the most effective method of control is by ligating or suturing the bleeding points. Counterpressure below the angle of the jaw and slow-moving sponge pressure across the fossa aid in locating the points of bleeding. For secondary and adenoid bleedings, sponge pressure is effective if maintained long enough. Correct-sized sponges may be held in the fossae with forceps or by suturing to the pillars, or they adhere to the fossae rather firmly with Monsel's solution, but should be string-attached to the cheek. Retained adenoid packs for 2 to 24 hours are fixed by bilateral intranasal strings tied over a sponge upon the columella to prevent their aspiration; cutting of the oral string 1 in. (3 cm.) below the palate facilitates removal of the pack and prevents laceration of the palate by a semiconcious patient's pulling the string. Proper control of bleeding requires good lighting, good exposure, and thorough inspection of the fossae from the bases to the upper poles and behind the anterior pillars, and in the nasopharynx. This is best obtained with good topical,

local, or general anesthesia. The risks of aspiration, anoxemia, and suffocation are great in this second anesthesia in the presence of bleeding. Hence, meticulous and thorough hemostasis at the time of surgery is of paramount importance, and speed is secondary. Ligatures and chromic absorbable surgical (gut) sutures cause little irritation and are not quickly dissolved by the saliva. The ideal is to have the patient lying in the prone position postoperatively, with no drop of blood coming from the nose or mouth. Another ideal is to have no complications and no deaths from tonsillectomy.

SUMMARY

A series is reported of 28,000 tonsillectomies performed by the Ross-Loos Medical Group, without any mortality and with very few complications. Complications are not only from personal experience but also some of those in the literature are reviewed. The serious nature of tonsillectomy is emphasized, and some of the various methods of preventing complications are noted.

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THE INTRANASAL USE OF HYDROCORTISONE ALCOHOL

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THE RECENT reports of Bordley and his co-workers * concerning the changes in the tissues of the upper air passages under adrenal cortical stimulation following the intramuscular administration of corticotropin (ACTH) and the oral administration of cortisone were received enthusiastically by otolaryngologists. The authors observed that under treatment with these hormones the allergic nasal mucous membranes lose their swelling, develop a slate pink color, and are covered with a layer of clear mucus. Polyps lose their translucence, begin to shrink, and, in many instances, disappear completely. These changes correlated with the initial eosinopenia developing under corticotropin therapy; in one patient, an intranasal spray of cortisone caused a slow but definite regression of polyps.

Dill and Bolstead [3] found that a local application of cortisone resulted in a marked improvement in 12 (48%) of 25 patients treated and some, but doubtful, improvement in 6 patients (24%); the rest (28%) showed no change in symptoms. Semenov [4] reported no beneficial effects from topical applications of cortisone solution given in sprays, drops, or packs, and found that the injection of a solution containing 25 mg. of cortisone into nasal polyps caused severe side-reactions. One of his patients had a violent reaction with flushing of the face, substernal pressure, and collapse. This reaction subsided within an hour. Three other patients had similar reactions. Semenov suggested the possibility of a relationship between this severe type of reaction and the pharyngeal pituitary gland, which is present in more than 95% of people. He felt that cortisone by injection was quite dangerous to use and of limited value in the nose. Williams [5] recently stated that the use of these hormones was still in the clinical investigation stage and cautioned against their indiscriminate use in disease of the ear, nose, and throat, because of the many dangerous side-effects which occur when they are given parenterally or orally.

It has been my experience that cortisone or corticotropin in the strengths required to effect beneficial results not infrequently produces objectionable complications and should be used only in patients who have failed to respond to more conservative therapy. Additional limitations to the use of these hormones in the treat-

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* References 1 and 2.

ment of allergic rhinitis arise from the fact that they are not readily soluble in water. Corticotropin can be administered only parenterally; cortisone acetate can be administered intramuscularly, orally, or topically; however, the insolubility of cortisone makes it difficult, if not impossible, to prepare an adequate solution of the drug.

The disadvantages of cortisone and corticotropin led to the search for other steroids which might be as therapeutically effective and less limited in use. Hydrocortisone (Compound F) has proved to be the most promising of the newer steroids resulting from this search; hydrocortisone alcohol, as distinguished from the acetate, has proved to be the most valuable form of this steroid. Boland [6] demonstrated that, when given orally, hydrocortisone alcohol is 50% more potent than either cortisone acetate or cortisone alcohol and twice as potent as hydrocortisone acetate.

The greater solubility of hydrocortisone alcohol (it is 28 times more soluble than the acetate) makes it particularly suitable for otolaryngological use. Accordingly, the following experiment was performed to determine, first, whether or not the topical administration of hydrocortisone alcohol would be of value in the treatment of nasal allergy and, second, if it is effective, what the lowest therapeutically valuable concentration of the hormone is. In addition to these clinical trials, an attempt was made to determine the local effects of hydrocortisone alcohol on pharyngeal and nasopharyngeal lymphoid tissue by taking biopsy specimens in 22 patients both before and after two weeks of treatment.

METHOD

This study was conducted for one year (December, 1952, to December, 1953) on 174 patients selected from private practice who suffered from either allergic rhinitis (98 patients), allergic rhinitis with polyps (57 patients), or acute rhinitis (19 patients). All patients' symptoms were either severe or moderately severe. Only objective response, evaluated by direct observation of the nasal membrane, was considered of major significance, and the results given, except when specifically qualified, are objective ones based on observed color changes in the allergic tissue, the reduction of tissue edema, and the shrinkage or disappearance of nasal polyps. Subjective response was also determined (by interviews with patients), but, unless there was a marked disparity between objective and subjective response, these subjective responses are not given in detail.

The patients ranged in age from 8 to 60; the majority (60%) were male. All patients were seen weekly for intervals ranging from 2 to 24 weeks (average, 12 weeks). The medicaments were administered by means of a plastic spray bottle. Patients were told to instil three squeezes of the spray bottle into each nostril four times a day. This method delivers about 0.2 cc. of the medication to each nostril.

Results were considered "excellent" if the medication caused a complete reduction of edema within two weeks, or if a significant shrinkage of polyps leading to their eventual disappearance occurred within that time. Results were considered "good" if the medication caused a significant reduction of edema (or a shrinkage of polyps which did not lead to their ultimate disappearance) within two weeks. Results were considered "fair" if a significant reduction of edema or shrinkage of polyps occurred within one month of treatment and "poor" if there was no (or equivocal) evidence of any beneficial change occurring in the nasal membrane.

The following formulae (all active agents in each formula were incorporated in a stable isotonic base) were evaluated: Formula A (a 5 mg. per 100 cc. solution of cortisone alcohol), Formula C (50 mg. per 100 cc. of hydrocortisone alcohol suspension), Formula O (a 22 mg. per 100 cc. solution of hydrocortisone alcohol), Formula S (a 20 mg. per 100 cc. solution of hydrocortisone alcohol), Formula P (a 2 mg. per 100 cc. solution of hydrocortisone alcohol), Formula AF (a 20 mg. per 100 cc. solution of hydrocortisone alcohol in combination with two

vasoconstrictors: hydroxyamphetamine hydrobromide, 0.5%, and phenylephrine hydrochloride, 0.125%), Formula PAA (the two vasoconstrictors alone), and Formula PAB (isotonic saline solution).†

The first formula was used to arrive at a rough comparison between cortisone alcohol, which is fairly soluble, and hydrocortisone alcohol. The last two formulae served as controls.

RESULTS

Tables 1 through 8 give the results obtained with each formula.

Results with Formula A.—The two allergic rhinitis patients who are listed in Table 1 as achieving a "fair" result reported a slight subjective benefit, which was not objectively evidenced. Two patients complained of nasal irritation. The two patients with polyps who achieved a "fair" result experienced a definite but very slight shrinkage of the polyps. The medication was adjudged ineffective.

TABLE 1.—*Results with Formula A (5 Mg. per 100 Cc. Solution of Cortisone Alcohol)*

Diagnosis	Patients, No.	Results			
		Excellent	Good	Fair	Poor
Allergic rhinitis	6	0	0	2	4
Allergic rhinitis with polyps	4	0	0	2	2
Totals	10	0	0	4	6

TABLE 2.—*Results with Formula C (50 Mg. per 100 Cc. Hydrocortisone Alcohol Suspension)*

Diagnosis	Patients, No.	Results			
		Excellent	Good	Fair	Poor
Allergic rhinitis	9	0	0	3	6
Allergic rhinitis with polyps	3	0	3	0	0
Acute rhinitis	6	0	0	3	3
Acute rhinitis with pus	3	0	0	0	3
Totals	21	0	3	6	12

TABLE 3.—*Results with Formula O (22 Mg. per 100 Cc. Hydrocortisone Alcohol Solution)*

Diagnosis	Patients, No.	Results			
		Excellent	Good	Fair	Poor
Allergic rhinitis with polyps	19	10	8	1	0

Results with Formula C.—The hydrocortisone suspension (Table 2) was of definite value in those patients with polyps, of very limited value in patients with allergic rhinitis, and of little or no value in patients with acute rhinitis.

Results with Formula O.—One of the 10 patients in whom the preparation (Table 3) resulted in the complete disappearance of nasal polyps had required surgical removal of polyps every year for the past six years. Several of these patients, and similar patients treated with the other formulae, experienced some recurrence of polypoid tissue when the medication was withdrawn.

Results with Formula S.—Formula S (which is slightly more dilute than Formula O) proved equally effective in the reduction of polyps and of marked value in allergic rhinitis; it was of no value in treating acute rhinitis (Table 4).

† The preparations used in this study were supplied by Smith, Kline & French Laboratories, Philadelphia.

Results with Formula P.—The fact that the extremely dilute solution, Formula P (Table 5), resulted in a significant shrinkage of polyps in four of these seven patients was considered striking evidence of the steroid's efficacy in this indication.

Results with Formula AF.—The addition of vasoconstrictors to the 20 mg. per 100 cc. hydrocortisone alcohol solution (Table 6) did not alter the efficacy of the steroid; however, it did affect the patient's subjective response to the medication.

TABLE 4.—*Results with Formula S (20 Mg. per 100 Cc. Hydrocortisone Alcohol Solution)*

Diagnosis	Patients, No.	Results			
		Excellent	Good	Fair	Poor
Allergic rhinitis	21	16	4	1	0
Allergic rhinitis with polyps	19	10	8	1	0
Acute rhinitis	3	0	0	0	3
Totals	43	26	12	2	3

TABLE 5.—*Results with Formula P (2 Mg. per 100 Cc. Hydrocortisone Alcohol Solution)*

Diagnosis	Patients, No.	Results			
		Excellent	Good	Fair	Poor
Allergic rhinitis with polyps	7	0	2	2	3

TABLE 6.—*Results with Formula AF* (20 Mg. per 100 Cc. Hydrocortisone Alcohol Solution Plus Two Vasoconstrictors)*

Diagnosis	Patients, No.	Results			
		Excellent	Good	Fair	Poor
Allergic rhinitis	32	25	4	1	2
Allergic rhinitis with polyps	5	2	2	0	1
Acute rhinitis	7	0	3	1	3
Totals	44	27	9	2	6

* Formula AF is now commercially available as Vasocort, Smith, Kline & French Laboratories.

TABLE 7.—*Results with Formula PAB (Isotonic Saline Solution)*

Diagnosis	Patients, No.	Results			
		Excellent	Good	Fair	Poor
Allergic rhinitis	12	0	0	2	10

All of these 44 patients claimed an immediate subjective relief; 20 hay fever patients claimed the medication was effective in reducing sneezing. Patient acceptance was enthusiastic. The greater efficacy of this formula in acute rhinitis may be attributed to the shrinking action of the vasoconstrictors, which may permit the steroid to be more efficiently distributed on the nasal membrane.

Results with Formula PAB.—The two patients who achieved a "fair" result (Table 7) experienced a slight, probably spontaneous, remission of symptoms after three weeks.

Results with Formula PAA.—The "good" to "excellent" results experienced by 13 patients (Table 8) were evidence of the effective action of the vasocon-

strictors, which caused an efficient, immediate shrinkage of the nasal tissue. In the three patients who experienced an "excellent" result, this reaction was unusually prolonged (six to seven hours); in 10 patients it was moderately prolonged (three to four hours). The three patients who achieved "fair" results achieved an immediate shrinkage of fairly short duration (one to two hours). The two patients who achieved a "poor" result evidenced no, or very slight, beneficial effect from the vasoconstrictors. One of the patients complained of nasal irritation. In none of these patients did the frequent (q.i.d.) use of the combination result in an undesirable tissue rebound. In none of the patients was there any evidence of lessened inflammation attributable to the vasoconstrictors.

There was no apparent correlation between the age or sex of the patients and the results achieved by the medications, nor was there any correlation between the severity of symptoms and the beneficial results achieved. Some patients with moderately severe symptoms experienced only fair relief; others with more severe symptoms experienced good to excellent relief. Two patients (neither of whom experienced any appreciable relief) complained of sneezing attacks following the use of the spray.

TABLE 8.—*Results with Formula PAA (Hydroxyamphetamine Hydrobromide, 0.5%, and Phenylephrine Hydrochloride, 0.125%)*

Diagnosis	Patients, No.	Results			
		Excellent	Good	Fair	Poor
Allergic rhinitis (pollenosis)	18	3	10	3	2

Although the dilute solutions of hydrocortisone alcohol demonstrate a marked ability to shrink polypoid tissue, many patients with multiple nasal polyps who obtained excellent results found that there was some return of polypoid tissue in three weeks to a month after the medication was discontinued. Some patients had an even more prompt return of polypoid tissue associated with acute nasal infections.

The biopsy specimens of lymphoid tissue revealed that there was no detectable difference, either grossly or microscopically, in the pretreatment and post-treatment specimens.

COMMENT

The results of this study indicate that not only does a topically applied hydrocortisone alcohol solution exert a beneficial effect on the allergic nasal membrane but also that it can exert this effect even when given in extremely dilute concentrations. This finding may assume added significance in view of the fact that investigations have shown that large doses of cortisone inhibit the action of antibiotics [7] and depress the ability of the reticuloendothelial cells to engulf pathogenic organisms. [8] The possibility of lowered resistance to infection resulting from this action of large doses of steroids would seem to be minimized, if not eliminated, by the topical use of the dilute solution of hydrocortisone alcohol.

The beneficial effect of the steroid on polypoid tissue was frequently marked, occasionally dramatic; however, it was not always permanent. It was observed that when multiple polyps were present, the posterior polyps shrank less than the anterior ones, which would indicate that the action of the steroid is a local one and not dependent upon absorption.

To properly appraise the steroids it might be well to point out briefly the physiologic effects of corticotropin. Under the stimulation of this pituitary hormone, the adrenal cortex increases the production of all its hormones, which can be grouped into the following three categories: (1) the androgenic steroids, (2) the salt and water steroids (reflected by sodium retention and potassium excretion), (3) the sugar or Compound E and Compound F hormones (reflected by increased corticoid excretion, increased uric acid secretion, and a lysis of circulating eosinophiles—the latter of which makes possible a clinical estimation of the degree of adrenal stimulation).

It is the stimulation of this third group of hormones by corticotropin which accounts for the similar clinical effects of corticotropin and cortisone (Compound E) and hydrocortisone (Compound F). This stimulation of Compound F substances by corticotropin becomes of interest in relation to inflammatory diseases and the diseases of hypersensitivity. The allergic manifestations of hypersensitivity are virtually abolished by the stimulation of Compound F substances by corticotropin. Local swelling and itching is diminished, and there is a marked modification of the inflammatory reaction. The clinical usefulness of corticotropin and cortisone is due to their effects in altering tissue reaction to hypersensitivity and inflammation, and through this altered reaction such phenomena as allergic rhinitis, allergic sinusitis, nasal polyposis, and asthma can be controlled.

Rawlins,[9] in attempting to explain the mode of action of the steroids in allergy, states that edema is the main pathology in the allergic state, and that clinically allergic edema is located in the gel of connective tissue. The enzyme hyaluronidase liquefies the neutral polysaccharide gel of connective tissue and thus produces edema. Hyaluronidase is present in and around connective tissue at all times. This enzyme is liberated from damaged tissue in large amounts in allergic inflammation and is thus available for the production of allergic edema. The adrenocortical hormones, by neutralizing the enzyme hyaluronidase, restrict allergic edema. This is one explanation for their remarkable effect in the allergic diseases.

Boland [6] points out that the superiority of hydrocortisone to cortisone stems from the fact that, as several studies ‡ have shown, it is the chief glycogenically active corticoid secreted by the adrenal gland, and a number of laboratory studies § indicated that hydrocortisone is more active physiologically than cortisone.

In a review of the results obtained in this study, and from previous experience with corticotropin and cortisone, there would appear to be little doubt that hydrocortisone alcohol is the most potent hormonal agent for the topical treatment of allergic nasal tissue.

Of the various hydrocortisone preparations tested (they ranged from a 2 mg. per 100 cc. solution to a 50 mg. per 100 cc. suspension), it was found that while all preparations were active, the most effective preparation for local application was the 20 mg. per 100 cc. solution combined with the two vasoconstrictors (Formula AF). This extremely dilute solution produced good to excellent clinical response in a majority of patients, and did not cause local irritation. The vasoconstrictors greatly increased the number of good to excellent subjective responses and did not interfere with but rather seemed to facilitate the action of the steroid.

‡ References 10 and 11.

§ References 12 and 13.

It is concluded that the dilute hydrocortisone alcohol solution in combination with the two vasoconstrictors is a highly effective adjunctive medication for the treatment of allergic rhinitis, and allergic rhinitis with polyps. It is of little or no value in treating acute nonallergic rhinitis. Treatment of allergic conditions in the nose by the intranasal hydrocortisone spray provides marked symptomatic relief; it does not cure any condition.

SUMMARY

A one-year study was conducted to determine what value, if any, topically applied solutions of hydrocortisone alcohol have in the treatment of nasal allergy, what the lowest therapeutically valuable concentration of the steroid is, and what effect the steroid might have on lymphoid tissue in the pharnyx and nasopharnyx.

The study was conducted in 174 patients suffering from the following conditions: allergic rhinitis (98 patients), allergic rhinitis with polyps (57 patients), and acute rhinitis (19 patients). The symptoms of all patients were severe or moderately severe.

Subjective results were determined by interviews with patients. Objective results were determined on the basis of observed color changes in the allergic membrane, the reduction of edema, and the shrinkage or disappearance of polyps. In addition to a 5 mg. per 100 cc. solution of cortisone alcohol, used to compare the efficacy of hydrocortisone with cortisone, the following preparations were evaluated: a 50 mg. per 100 cc. suspension of hydrocortisone alcohol; 22 mg. per 100 cc., 20 mg. per 100 cc., and 2 mg. per 100 cc. solutions of hydrocortisone alcohol; a 20 mg. per 100 cc. solution of hydrocortisone alcohol containing two vasoconstrictors, hydroxyamphetamine hydrobromide and phenylephrine hydrochloride; a solution containing the vasoconstrictors alone, and an isotonic saline solution. The last two preparations served as controls.

Patients were seen at weekly intervals for from 2 to 24 weeks (average, 12 weeks). Medications were administered q.i.d. by means of a plastic spray bottle.

Biopsy specimens were taken from the nasopharyngeal or pharyngeal lymphoid tissue in 22 patients both before and after two weeks of treatment with a 20 mg. per 100 cc. hydrocortisone alcohol solution.

The cortisone alcohol solution proved ineffective in treating all conditions; all the hydrocortisone alcohol solutions evidenced a significant beneficial effect on allergic rhinitis and allergic rhinitis with polyps. Their effect on polyps was often dramatic but sometimes temporary. The solutions were of no value in acute rhinitis. The 20 mg. per 100 cc. solution of hydrocortisone alcohol in combination with the vasoconstrictors proved to be the most effective medication.

The steroid solution evidenced no effect on the growth of nasopharyngeal or pharyngeal lymphoid tissue either grossly or microscopically.

It was concluded that the combination of the 20 mg. per 100 cc. hydrocortisone alcohol solution with the two vasoconstrictors is of significant benefit in the treatment of nasal allergies, and is capable of exerting a marked anti-inflammatory action, in addition to providing effective subjective relief.

ADDENDUM

From June, 1953, to August, 1954 (the final six months in which these eight formulae were evaluated, and the eight months following their evaluation) an attempt was made to see if, by adding antibiotics to Formula AF, a formula could

be prepared which would be an equally effective local treatment for allergic rhinitis and polyposis and, hopefully, a more effective treatment for bacterial infections causing and/or accompanying nasal inflammation. Accordingly, a ninth formula (Formula AD) was prepared, which contained the same hydrocortisone-vasoconstrictor components as Formula AF plus the following antibiotics: gramicidin, 0.005%; neomycin sulfate, 0.100%; polymyxin B sulfate, 2,000 units per milliliter. These antibiotics were chosen because they have been clinically established for the local treatment of upper respiratory infections, and because their use eliminates the danger of sensitizing the patient to antibiotics which are frequently used systemically in serious infections.

The criteria for evaluating beneficial tissue changes in allergies and polyposis remained the same. The criteria for evaluating the antibacterial action of the formula were these: "Excellent," a complete remission of infection in one week; "Good," a complete remission of infection within two weeks; "Fair," a complete remission of infection within one month; "Poor," an incomplete remission of infection after one month of treatment. The results obtained with the new formula are given in the following Table:

Results with Formula AD (20 Mg. per 100 Cc. of Hydrocortisone Alcohol, Two Vasoconstrictors, and Three Antibiotics)

Diagnosis	Patients, No.	Results			
		Excellent	Good	Fair	Poor
Allergic rhinitis	59	38	6	1	5
Allergic rhinitis with polyps	12	10	2	0	0
Allergic rhinitis with infection	14	6	6	2	0
Acute rhinitis	14	7	5	1	1
Totals	99	61	19	4	6

Comment.—Formula AD showed a marked superiority over the other formulae in treatment of bacterial infections causing or accompanying nasal inflammation. It was equally effective in the treatment of inflamed nasal tissue of one patient with allergic rhinistis accompanied by infection who achieved a "fair" response and those of the one patient with acute rhinitis who achieved a "poor" response were only moderately severe; the symptoms of the majority (75%) of the patients who achieved a "good" to "excellent" response were quite severe. Evidently the extremely dilute hydrocortisone content of the preparation was not sufficient to appreciably inhibit the action of the antibiotics, and the combination of antibiotics proved very effective in treating bacterial infection. It would seem, then, that Formula AD is the treatment of choice for acute rhinitis, and allergic rhinitis accompanied by infection.

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MALIGNANT TUMORS OF THE NASOPHARYNX

Transpalatine Surgical Excision

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LOS ANGELES

THE NASOPHARYNX is relatively inaccessible. This space has been termed "an obscure area," [1] a "blind spot," [2] a "hidden cavity," * an "unknown region," [5] and "the most neglected area in otolaryngology" [6] (Fig. 1).

INCIDENCE

During a five-year period (1948-1953), at the Los Angeles County General Hospital, 16 primary malignant tumors of the nasopharynx were observed. Since

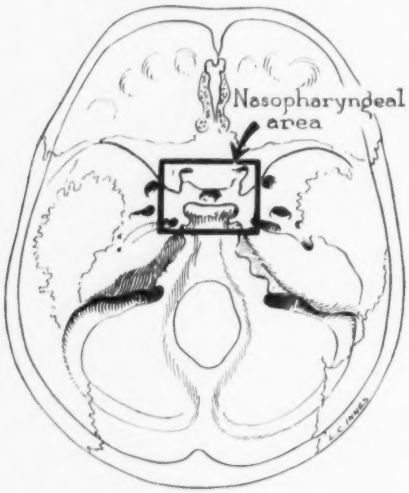

Fig. 1.—The area of the nasopharynx seen from above.

1942, at the White Memorial Hospital, there have been observed 17 cases of primary malignant growth in this region. Of these 33 patients, the youngest was a 16-year-old girl, the oldest a 70-year-old man. The majority were in the sixth and seventh decades. There were 25 males and 18 females. There were 24 Caucasians,

Read before the Pan-American Congress of Otolaryngology, México, D.F., March 2, 1954.

From Los Angeles County General Hospital, White Memorial Hospital, and the Department of Otolaryngology, College of Medical Evangelists.

* References 3 and 4.

including 4 Mexicans, and there were five Chinese, two Japanese, one Filipino, and one Negro. The 1950 United States census gives as the racial distribution in the metropolitan Los Angeles area that presented in Table 1.

TABLE 1.—*The 1950 United States Census of the Metropolitan Los Angeles Area*

Race	Population			
	No.		%	
Caucasian		4,402,875		94.09
Mexican	311,294		6.65	
Others	4,091,581		87.44	
Negro		218,710		4.68
Japanese		37,947		0.81
Chinese		9,304		0.20
Others		10,309		0.22
Total		4,679,145		100.00%

TABLE 2.—*Number and Racial Distribution of Patients with Malignant Nasopharyngeal Tumors in Two Hospitals*

Race	Patients in Los Angeles County Hospital	Patients in White Memorial Hospital	Total	
			No.	%
Caucasian	11	13	24	73
Mexican	1	3	4	12
Others	10	10	20	61
Oriental	3	4	7	21
Chinese	2	3	5	15
Japanese	1	1	2	6
Malay	1	..	1	3
Negro	1	..	1	3
Total	16	17	33	100%

TABLE 3.—*Population of Two Hospitals and Their Racial Distribution in 1953*

Race	Patients in Los Angeles County Hospital		Patients in White Memorial Hospital	
	No.	%	No.	%
Caucasian	62,237	71.59	7,172	81.71
Mexican	15,040	17.30	.....	.....
Others	47,197	54.20	.....	.....
Oriental	378	0.43	346	3.94
Chinese	.....	.....	.....	.....
Japanese	.....	.....	.....	.....
Malay	104	0.12	.....	.....
Negro	24,105	27.73	1,249	14.23
Others	120	0.13	10	0.12
Total	86,934	100.00%	8,777	100.00%

The racial distribution of the 33 patients in the two hospitals is indicated in Table 2.†

† Los Angeles County General Hospital is a tax-supported institution, most of the patients being indigent. White Memorial Hospital is owned and operated by the College of Medical Evangelists as a teaching unit. The clinical records of both hospitals were utilized in this study.

The number of patients treated during 1953 in the two hospitals and their racial distribution is shown in Table 3. The proportions of the different races and the number of patients remain about the same from year to year. The incidence of malignant tumors among the Chinese is 15% and among the Japanese 6% in the two hospitals.

The Japanese population in the Los Angeles area is 0.81%, and the Chinese is 0.20%. The Oriental patients constitute 4.37% of the patients in the two hospitals. The disproportionately high incidence of nasopharyngeal tumors among the Chinese is well demonstrated.

Nasopharyngeal malignant tumors constitute about 1 to 3% of all the malignant tumors in the United States ‡ and 8% of those seen in otolaryngologic clinics in Great Britain.[8] In Hong Kong the incidence is 18% of all malignant tumors.[9] Males are affected three times as often as females, according to the large number of published records. The Chinese, particularly those from the southern province of China, have shown marked susceptibility.§

TABLE 4.—*Classification of Thirty-Three Malignant Tumors of the Nasopharynx*

Malignant Tumor, Type	Tumor Patients in Los Angeles County Hospital, No.	Tumor Patients in White Memorial Hospital, No.
Squamous-cell carcinoma	6	9
Anaplastic carcinoma	5	2
Lymphepithelioma	3	3
Salivary-gland tumor	1	1
Lymphoma	1	1
Plasmocytoma	..	1
Total	16	17

HISTOPATHOLOGY

The mucous membrane of the nasopharynx is of the ciliated pseudostratified columnar respiratory type. The oropharynx is covered with squamous-cell mucosa. From an embryologic viewpoint, the union of the two different tissues forms a most favorable site for a neoplastic growth. The lymphoid tissue is present at birth and continues to grow in size and cytogenic activity until adolescence, when regression occurs. Sarcoma may originate in this area. Aberrant salivary gland tissue is not infrequently found in this area. Tumors are usually well encapsulated but have a tendency to recur after surgical extirpation. Mesodermal malignancy occurs in connective tissue elements. The most frequent malignant epidermal lesions that are found in this region are squamous-cell carcinomas. There is no unanimity of opinion among the pathologists whether to regard lymphepithelioma and transitional-cell carcinoma as epidermic or mesodermic in origin. There is a tendency to consider them as sarcomas of various stages of development. Plasmocytoma in the nasopharynx is a rare nonulcerating extramedullary growth which arises from lymphatic tissue in this area. These tumors may be single or multiple, malignant or benign.

The 33 cases of malignant tumors reported in this series are classified in Table 4.

‡ References 5 and 7.

§ References 10 and 11.

SYMPTOMATOLOGY

The symptomatology produced by the growth of the tumors is related to the anatomy and physiology of this area. The earliest symptoms are (1) vague throat irritation, (2) alteration of vocal resonance, (3) intermittent tubal obstruction, (4) abnormal postnasal discharge, and (5) occasional epistaxis. Unfortunately, the patients with this disease usually wait until other signs develop. Because of the diversified pattern of the initial symptoms, the primary site of the growth often remains undetected until development of secondary lesions in the adjacent structures, occurrence of metastasis, or a mechanical obstruction. In this series of 33 patients, the initial objective signs were cervical adenopathy in 13, nasal obstruc-

Fig. 2.—Bilateral cervical adenopathy in a 34-year-old Chinese man with lymphepithelioma.

tion in 12, visual disturbance and head pain in 5, and impaired hearing in 3. Depending upon the presenting symptoms, the patient with this condition seeks the services of the general practitioner, surgeon, neurologist, ophthalmologist, or otolaryngologist. Thus the tumor in this area presents one of the most serious problems in the practice of medicine.

1. *Cervical Metastasis.*—Cervical metastasis is often the earliest sign of malignancy in this area (Fig. 2). The spread first occurs into the lateral retropharyngeal glands. In most instances either one or both sides of the retromandibular groups are then involved. In others, the spread occurs directly into the deep cervical, the jugular, and the spinal accessory nodes (Fig. 3). To the physician, painless upper cervical adenopathy should be a challenge to rule out primary malignancy of the

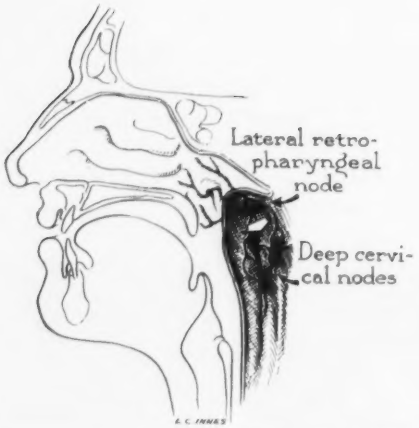

Fig. 3.—The lateral retropharyngeal nodes are first affected. Metastasis may occur directly into the deep cervical and jugular nodes.

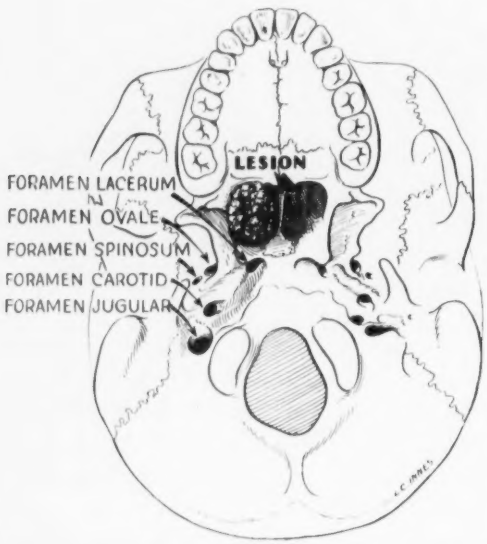

Fig. 4.—The growth may spread through foramina and fissures, or it may be transplanted by the vascular channels and nerve fibers.

respiratory tract. According to Godtfredsen,‖ the cervical metastasis occurred in 70% of 454 cases and other signs appeared in 40 to 50%. There was a lapse of 10 to 11 months between the appearance of these signs and the discovery of the site of the primary growth. Simmons and Ariel [14] stated that of their 150 cases there was cervical metastasis in 86% and an average lapse of 6.9 months between the first visit to the physician and the time the correct diagnosis was established. Much can be accomplished if this period of procrastination is shortened. This is the responsibility of the medical profession.

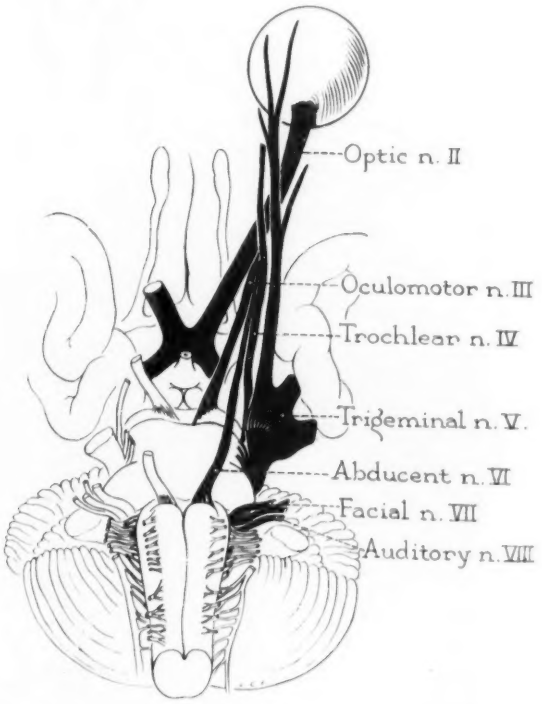

Fig. 5.—Visual disturbances, ocular paralysis, and persistent headache may be the initial signs. The abducens nerve is the most vulnerable, owing to its long intracranial course. The fifth, third, and fourth nerves are next involved, in order named, either by compression or infiltration.

2. *Nasal Symptoms.*—Patients with tumors adjacent to the nasal choana develop the signs of nasal obstruction, such as a nasal twang, nasal discharge, and, if the tumor is ulcerated, blood-tinged rhinorrhea and epistaxis. Secondary sinusitis may be the symptom which prompts the patient to seek medical aid.

3. *Visual Disturbance and Headaches.*—The nasopharynx is intimately related to the brain stem. The foramen lacerum is but 1 cm. anterior to the fossa of Rosenmüller. The growth rapidly invades any of the preformed foramina and fissures (Fig. 4). It may produce compression on the vital structures. Erosion of the base

‖ References 12 and 13.

of the skull is not rare.[15] The abducens nerve (sixth) (Fig. 5) is the most vulnerable, owing to its long intracranial course. The other cranial nerves closest to the nasopharynx are next affected. These are the fifth, third, and fourth, in the order

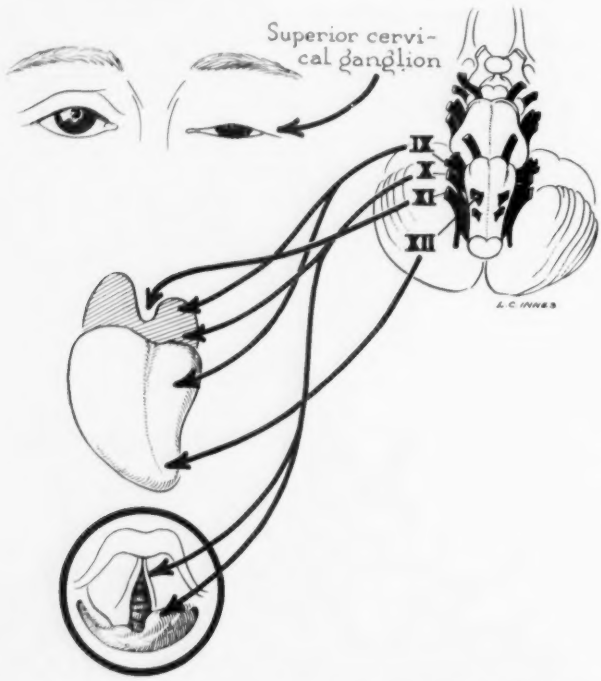

Fig. 6.—The jugular foramen and Horner's syndrome may occur when the spread involves the lower cranial and sympathetic nerves (modified after Ackerman and Regato).

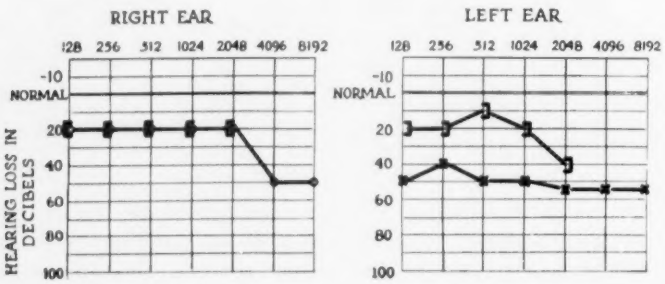

Fig. 7.—Audiograms of 57-year-old Caucasian man, whose left Eustachian tube was partially closed by a tumor.

named. Patients with these nerves affected complain of visual disturbances, ocular paralysis, facial pain, and either unilateral or bilateral headache and trismus. When the growth encroaches upon the region of the jugular foramen, paralysis of some or all of the lower four cranial (9th, 10th, 11th, and 12th) and cervical sympathetic

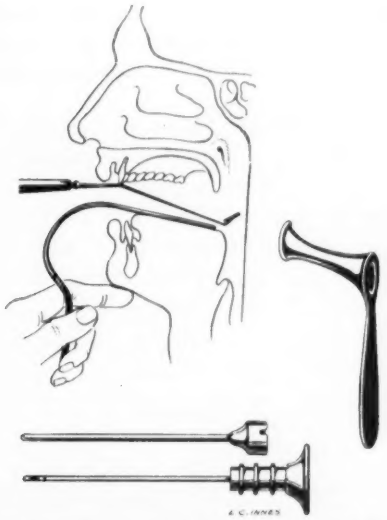

Fig. 8.—The diagnosis is made by inspection with one or all of these instruments. Cytologic investigation and biopsy should confirm the diagnosis.

Fig. 9.—Obliteration of the normal outline at the base of skull, due to bony erosion. The arrow indicates the normal area.

nerves may be observed (Fig. 6). There are a number of cases on record in which all the cranial nerves have been involved in the course of the disease.¶ Three of five patients in this group with head pain were admitted with a diagnosis of brain tumor.

4. *Aural Manifestations.*—Those tumors arising adjacent to the Eustachian tube and fossa of Rosenmüller cause intermittent and later permanent tubal obstruction, as reflected in tinnitus, impaired hearing, and serous otitis. An audiogram of a 54-year-old patient with the tubal obstruction is shown in Figure 7. Both Ormerod and Nielsen [18] cited cases in which the tumor had invaded the middle ear and the biopsy specimen was taken from the external auditory canal.

In every series of cases reported in literature, numerous surgical procedures and therapeutic measures have been resorted to for relief of symptoms which are wholly unrelated to the primary lesion. This series is no exception. A 51-year-old Mexican man sought relief from nasal obstruction of three months' duration. Submucous resection of the nasal septum was advised. During the course of the

TABLE 5.—*Summary of Treatment of Thirty-Three Patients*

	Patients Treated by Irradiation					Patients Treated by Surgery			
Tumor, Type	Total No.	Died of Disease	5-Yr. Survival	Admission 1952-1953	Lost Contact	Total No.	Alive	5-Yr. Survival	Observed
Squamous-cell carcinoma	15	11	2	2	..	..	..	..	..
Anaplastic	7	6	..	..	1	..	..	..	..
Lymphepithelioma	6	3	1	1	1	..	..	..	..
Mixed salivary-gland tumor	2	..	..	..	..	2	2	1	1
Lymphoma	2	1	..	..	..	1	1	..	1
Plasmacytoma	1	..	1	..	..	..	..	..	..
Total	33	21	4	3*	2	3	3	1	2*

* Five cases are excluded in the calculation of five-year cures.

operation, a tumor was discovered in his nasopharynx. After intensive irradiation, the patient was symptom-free for three years and then died of recurrence. Three tonsillectomies and one polypectomy appear to have been performed elsewhere before a diagnosis was established in one of the hospitals.

DIAGNOSIS

A small mirror for posterior rhinoscopy and Yankauer's nasopharyngoscope and electrically illuminated endoscope are indispensable for visual investigation of the nasopharynx (Fig. 8). Upon the first examination a small tumor may escape the scrutiny of the most experienced observer. Repeated inspection is indicated. A digital palpation, with or without general anesthesia, is informative. The outline of the larger tumor may be seen on laminography.[19] Cytologic investigation of the secretion is promising.[20] Biopsy specimens should confirm diagnosis. At times several biopsy specimens may be required for confirmation. In well-established cases, erosion of the base of the skull and destruction of the osseous structures are sometimes observed on x-ray films (Fig. 9). Of the 33 patients in this series, at the

¶ References 16 and 17.

time of their admissions, 10 showed evidences on their x-ray films of erosion of the base of the skull, 2 erosion of the ribs and scapula, 2 destruction of dorsal spines, and 2 metastasis to the lungs.

PROGNOSIS AND TREATMENT

Irradiation is the treatment of choice for both sarcomatous and epithelial growths. The malignant growth in this area is highly radiosensitive. However, unfortunately, radiosensitivity does not imply radiocurability in every instance. The differentiation between carcinoma, lymphepithelioma, and lymphosarcoma is relatively unimportant as far as treatment is concerned because of the individual variation of radiosensitivity within each group. According to Eberhard and Leaming,[21] the most important single criterion for the prognosis is the presence or absence of bone involvement. Without bone involvement nearly 40% salvage can be expected. With bone involvement this is reduced to 10%. When the growth has not spread beyond the upper cervical nodes, according to Lenz, a five-year cure is attained in 27.6%. Martin and Blady obtained 20 five-year cures in a group of 80 patients, or 25%. Kramer[22] also recorded a five-year survival rate of 25% in his series of 54 patients. At the Mayo Clinic the rate was 13% for the group of 234 patients.[23] In the present study, 30 patients received radiation only. Twenty-one died of the disease. Two failed to respond to our follow-up inquiries. There were four who survived the five-year period. Two with epidermoid carcinoma and one with lymphepithelioma are living. The period of observation was too short to assess the effectiveness of the treatment.

SURGICAL EXTIRPATION

Experience has shown that certain tumors in this area are best dealt with by surgical removal, preceded, followed, or both preceded and followed by irradiation. Among these tumors are benign angiofibroma, fibrosarcoma, adenocarcinoma, and, sometimes, a well-localized lymphoma. One patient with mixed salivary-gland tumor has lived without recurrence for five years following surgery; another has lived for two years and two months, but the tumor has spread to adjacent areas. One patient with lymphoma had the growth surgically extirpated and then irradiated. There are five patients who have been under observation less than five years. For obvious reasons these are not included in the five-year survival rate. There are 5 of the 28 patients in this group which are known to have obtained five-year cures, a 17.8% rate, with 95% confidence limits of from 6.1 to 38.8%.[24] Both Owens[25] and, recently, Walker[26] described a transpalatine approach for correction of choanal atresia, and I have adopted the similar approach to the nasopharynx, for it gives a complete view of the field of operation without sacrificing the vital structures (Fig. 10). The transpalatine approach gives an excellent postoperative cosmetic effect of the soft palate. There is no distortion of the soft palate, since it is not split. The technique is as follows: The patient is placed on his back. Intratracheal anesthesia is administered, and the hypopharynx is snugly packed with a strip of gauze, to prevent aspiration of oral secretion and blood. A Davis mouth gag is then introduced. A horseshoe-shaped incision is made down to the bone, beginning 1 cm. medial to the last molar tooth on the left, then swept along the dental arch forward, just back of formamina of Scarpa, then to the right third

molar. This incision goes as far back as the posterior palatine foramen but does not include the palatine vessels on either side. With a heavy periosteal elevator the soft tissue over the hard palate and palatine bone is lifted out of its attachment. When the posterior border of the palate bone is reached, a curved dissector is used to elevate the nasal mucosa from the floor of the nose. The amount of the palate bone and of the vomer to be sacrificed depends upon the operative indication. This part of the operation is done with Hajek's biting rongeur. A soft rubber catheter is intro-

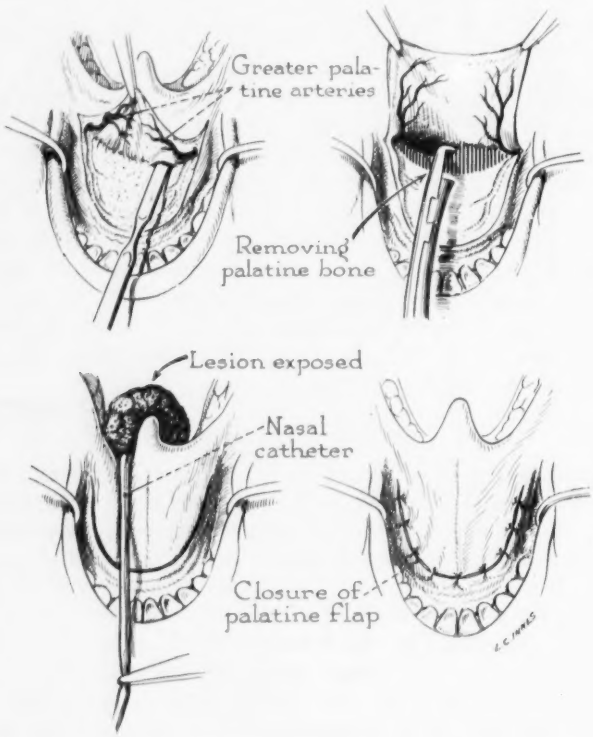

Fig. 10.—Transpalatine approach to the nasopharyngeal tumor: (Upper left) A horseshoe-shaped incision made along the dental arch. The soft structures, including the posterior palatine vessels and periosteum, are elevated beyond the posterior margin of the hard palate. (Upper right) Nasal mucosa is freed from its bed to permit the Hajek forceps to grasp an adequate portion of the palate bone. (Lower left) Retraction on nasal catheter affords ready access to the site of the growth. (Lower right) The wound closed by interrupted sutures.

duced into each nostril and delivered through the mouth. When gentle traction is applied on the catheters, one obtains an adequate view of the operative field. The tumor is dissected and then snared. The stump of the growth may be cauterized by diathermy current. With such an approach the operator obtains perfect hemostasis. There is no area in this cavity which cannot be explored under direct vision. Through this same approach the sphenoid sinus above and the choanal orifices

anteriorly can be readily reached. When the growth is completely removed, traction on the catheter tubes may be released. The palatine flap is gently replaced and sutured. The wound heals in three to four days.

The outlook for the management of malignant tumors of the nasopharynx is not too dark. The earlier the diagnosis, the better the final outcome will be.

SUMMARY AND CONCLUSIONS

Observations on 33 primary malignant neoplasms of the nasopharynx are presented. These include 15 squamous-cell carcinomas, 7 anaplastic carcinomas, 6 lymphepitheliomas, 2 mixed salivary-gland tumors, 2 lymphomas, and 1 plasmocytoma.

The initial symptoms were cervical adenopathy in 13 patients, nasal obstruction in 12, persistent head pain in 5, and impaired hearing in 3.

Irradiation is the treatment of choice for both sarcoma and carcinoma. Surgical extirpation in conjunction with irradiation is indicated in fibrosarcoma, adenocarcinoma, and, sometimes, for a well-localized lymphoma.

Transpalatine resection of nasopharyngeal growth is described.

436 S. Boyle (33).

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THE CONDUCTIVE MECHANISM OF HEARING AND RECRUITMENT

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INTRODUCTION

IT IS THE purpose of this paper to present to its readers a working hypothesis which may further aid in the interpretation of audiologic data. It deals with two factors which, by and large, are considered to be somewhat unrelated: the conductive mechanism of hearing and auditory recruitment.

THE CONDUCTIVE MECHANISM OF HEARING

The conductive mechanism of hearing is usually considered to consist of the outer and middle ears, along with their component parts and contents; it is my suggestion that a different, more recently described, concept be established. Rather than consider the conductive system as constituting anatomical structure, let us consider the fact that this system is far more inclusive; actually, it consists primarily of the sound-conducting media.

For purposes of simplicity, the conductive mechanism of hearing can be divided into three parts: (1) air medium, (2) impedance matching mechanism, and (3) fluid medium.

Air Medium.—Under normal listening conditions, sound is transmitted from its source to the ear by means of the environmental medium of air. These air-borne sounds arise at their source, are dispersed through the air in the form of sound waves, and are finally gathered by the auricle and funneled into the external acoustic meatus, where they terminate at the tympanic membrane. It is therefore suggested that, rather than consider the external ear as a part of the conductive mechanism, we consider the air within the external ear, along with the environmental air between the listener and the sound source, as representing the first part of the conductive mechanism of hearing.

Impedance Matching Mechanism.—Since the hair cells, the actual end-organ of hearing, exist within a fluid environment, and since the sound to be heard is transmitted through air, it is necessary that some form of physical transformer be used to compensate for the differences of density and elasticity of these two media; this transformer exists in the form of the tympanic membrane, the ossicular chain, and their connecting and supporting tendons and ligaments (Wever and Lawrence). It is suggested, therefore, that, rather than being the primary conductive mechanism of hearing, the middle ear should be considered a physical transformer with its main function being that of an impedance-matching device which connects the air-borne sound of the outer ear with the fluid-borne sound of the inner ear.

Fluid Medium.—As a departure from more conventional concepts, let us consider the inner ear as a major part of the conductive mechanism.

Because of its function of conducting and perceiving sound waves which were transmitted through the fluid medium of water, it is believed that the primitive aquatic ear was simply a fluid-filled sac containing a layer of sensory cells in contact with a loading mass. As sound waves were transmitted through the surrounding water, they impinged upon the sac, setting it in vibration and, in turn, setting the inclosed fluid in vibration, which stimulated the sensory cells and produced the sensation of hearing. As certain species of aquatic life migrated to land, the differences in density and elasticity of their environmental media (water and air) resulted in a reduction in the efficiency of the organ of hearing; as a result, the middle ear evolved.

As in the primitive aquatic ear, the fluid within the inner ear of man acts as a sound-conducting medium which transmits sound waves generated by the footplate of the stapes through the perilymphatic system, across the membranous labyrinth, into the endolymphatic system, and, finally, stimulates the hair cells—the beginning of the perceptive mechanism of hearing (Fig. 1).

Fig. 1.—Schematic diagram illustrating the conductive pathways of sound: from the environmental air of the listener, across the middle ear, into the perilymphatic system, through the membranous labyrinth, and, finally, stimulating the hair cells—the beginning of the perceptive mechanism of hearing.

THE PERCEPTIVE MECHANISM OF HEARING

For purposes of this paper, I shall define the perceptive mechanism of hearing as beginning with the hair cells, continuing on through the spiral ganglion and eighth nerve, and terminating in the brain.

RECRUITMENT

Since the discovery of the recruitment phenomenon, it has been the common consensus of opinion that its presence was indicative of a lesion located somewhere within the neural mechanism of the ear. More recent investigators, however, have presented findings which seem to indicate that, rather than signifying the presence of an unspecified nerve loss, recruitment is found only when the lesion involves the hair cells; it does not appear to be present in retrocochlear lesions. Whereas there is little question as to the fact that recruitment is characteristically present in cases of acoustic trauma, Ménière's syndrome, and secondary nerve losses due to otosclerosis and otitis media, many feel that the absence of recruitment is characteristically found in cases of acoustic tumors, pontinangle lesions, and presbycusis.

COMMENT

In light of the above, it is my suggestion that there may be a possibility that recruitment is not an indication of any type of nerve lesion but is, rather, an indication of a pseudo nerve lesion or a conductive lesion within the inner ear!

It is a generally accepted fact that the hair cells, which constitute the end-organ of hearing, are of the type which, when injured or destroyed, are not capable of rejuvenating or reproducing themselves. It is interesting to note, therefore, that

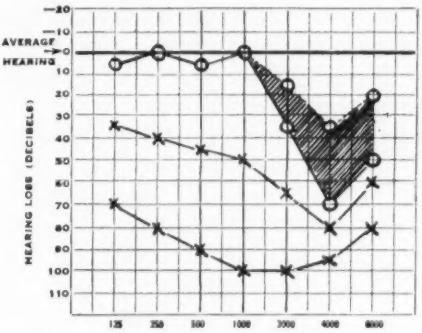

Fig. 2.—Audiogram representing a case of acoustic trauma. Solid line represents thresholds following exposure to high intensity noise but prior to rest; broken line represents same ear following period of rest; shaded area represents reversible lesion due to fatigue. Note complete recruitment obtained prior to period of rest.

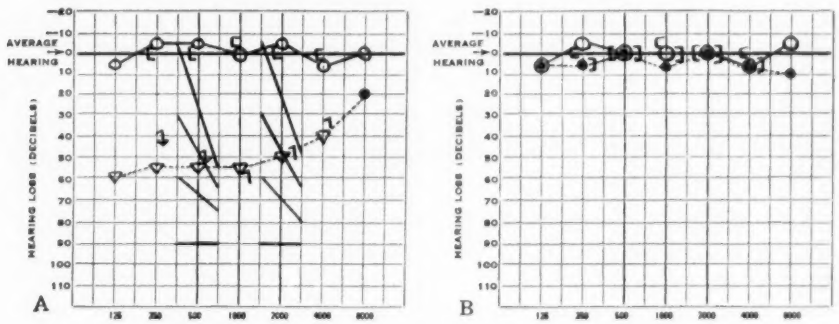

Fig. 3.—Audiograms of a patient with Ménière's syndrome. Audiogram *A* represents hearing one hour prior to attack of vertigo; Audiogram *B* represents hearing 15 hours following the attack. Note complete recruitment in Audiogram *A*.

in those types of cases in which recruitment is believed to be characteristically present the reduced bone-conduction thresholds are very often either partially or completely reversible!

Acoustic Trauma.—It is a well-known fact that, in noise-susceptible ears, fatigue, or a temporary threshold shift, plays a major part during the initial stages of trauma. A traumatized ear which has been exposed to high intensity noise levels over a comparatively short period of time has, in addition to a "permanent" lesion, a superimposed threshold shift, which, after removal from the noise environment,

becomes reversible. In the advanced case, however, when the ear has been exposed to high intensity sound over a prolonged period of time, this reversal does not occur. Is it not possible, therefore, that in these advanced cases normal environmental noise is sufficiently intense to prevent a reversal of the temporary threshold shift? Since normal environmental noise is, in itself, of considerable intensity, is it not reasonable to assume that at least part of the "permanent" threshold shift is potentially reversible (Fig. 2)?

In light of the above, is it, therefore, not possible that the recruitment found in acoustic trauma is actually a function of the temporary threshold shift? Although the actual dynamics of the temporary lesion is not known, is it not reasonable to hypothesize that this lesion may be the result of a mechanical disturbance of the hair cells or a conductive lesion within the inner ear?

Ménière's Syndrome.—In patients with Ménière's syndrome, it is not at all uncommon to find reasonably good hearing for the high frequencies while, at the

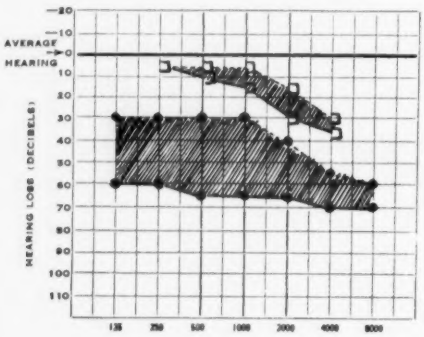

Fig. 4.—Composite audiogram representing a case of otosclerosis. Solid lines represent preoperative air- and bone-conduction thresholds; broken lines represent postoperative air- and bone-conduction thresholds; shaded areas represent operative gain in air and bone conduction hearing.

same time, hearing for the low frequencies is considerably reduced. Audometrically, these cases frequently present a fluctuating "low frequency perceptive loss" (Fig. 3).

Since it has been histologically established that Ménière's syndrome is characterized by hydrops within the endolymphatic system, it appears quite obvious that the reduced threshold of hearing must be, at least in part, due to the increased intralabyrinthine pressure. This, in effect, produces an increased impedance, or conductive lesion, within the inner ear.

Secondary Nerve Loss Due to Otosclerosis.—Since it has been observed by many investigators that, after fenestration surgery, significant improvement in the bone-conduction thresholds occur, it can be considered safe to assume that the reduced bone-conduction threshold in otosclerosis is not entirely due to a neural lesion. It is felt that this reversible threshold shift is primarily a result of the impedance mismatch between the oval and round windows. Because of this artifact, it appears to be impossible to ascertain the absolute cochlear reserve in an oto-

sclerotic ear. It is known that fenestration surgery removes a certain amount of the mechanical shift of the bone-conduction threshold, but, particularly in the advanced case, it is not known how much of the artifact remains (Fig. 4).

Once again, there is evidence of a conductive lesion producing reduced hearing by bone conduction and, at the same time, a pathological type in which recruitment is characteristically present.

Secondary Nerve Loss Due to Otitis Media.—As in the case of otosclerosis, adhesive otitis affects the mobility of the ossicular chain and, in turn, impedes the passage of sound through the oval window. Again, this is an example of an impedance mismatch between the oval and round windows and, as a result, a probable artifact in the form of reduced hearing by bone conduction.

An Unclassified Case.—A 48-year-old professional man developed a spontaneous unilateral hearing loss which, upon audiological evaluation, was found to be a pure "nerve loss" with complete recruitment, tinnitus, and markedly reduced discrimination for speech. Although otological findings were completely negative,

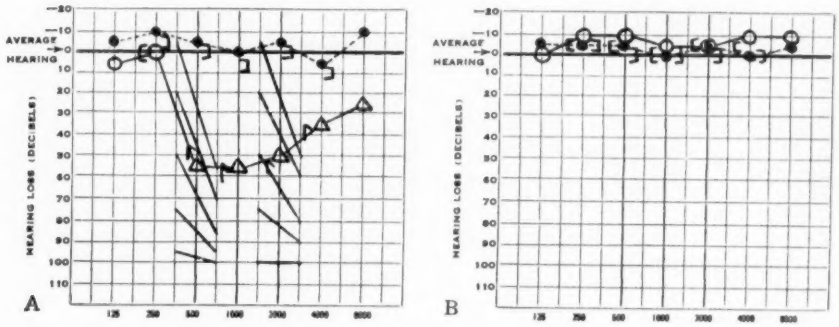

Fig. 5.—Audiograms representing the unclassified case mentioned in the text. Audiogram *A* represents premyringotomy hearing; Audiogram *B* represents postmyringotomy hearing. Note complete recruitment in Audiogram *A*.

the patient complained of a feeling of "stuffiness in the ear," and, upon a "clinical hunch," a myringotomy was performed. Immediately after this procedure, the patient reported the "sensation of air rushing into the ear," and, within two hours, the symptom of deafness disappeared (Fig. 5).

Although this phenomenon has not been explained, I should like to present the following hypothesis: If it is assumed that a negative pressure existed within the middle-ear cavity, rather than the usual course of events causing a retraction of the tympanic membrane, the round-window membrane may have bulged into the middle ear and, in turn, caused a negative pressure within the perilymphatic system relative to the endolymphatic system. This, as in Ménière's syndrome, would produce a bulging of the membranous labyrinth and, audiologically, could produce the same general type of dysfunction.

Because of the functional results of the myringotomy, it can be considered reasonably safe to assume that this lesion was conductive in nature; however, since complete recruitment was found to be present, the pathological cause of recruitment can be questioned.

SUMMARY

Since no histological evidence is being presented, it is not my purpose to present factual material but, rather, to present a working hypothesis.

Does recruitment indicate a neural lesion? Or is it an indication of a potentially reversible "conductive lesion within the inner ear"?

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INVALIDITY OF THE PHYSIOLOGIC INFERENCE OF EWALD'S LAW —ITS CLINICAL IMPORTANCE

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EWALD, in 1892, reported the results of his experiments with pigeons on the physiology of the semicircular canals.* As a result of these experiments two physiologic laws were formulated, and, as expressed in Morrison's textbook,[3] are as follows: First, the horizontal semicircular canal gives a maximal response by movement of its endolymph toward its ampulla, while the reverse is true of the vertical semicircular canals. Second, when a canal is maximally stimulated, there results a nystagmus to the same side. Therefore, stimulation of the vestibular end-organ results from movement of the endolymph in the semicircular canal, which causes a bending of the cilia of the vestibular end-organ cells of the crista ampullaris.[3] Ewald's law suggests that when the cilia of the horizontal semicircular canal are bent by a flow of endolymph toward its ampulla, maximal stimulation results. After this, Bárány observed clinically in the turning test, in stimulating the horizontal semicircular canals of patients who had sustained a completely destroyed labyrinth, e. g., the left, by a diffuse suppurative labyrinthitis, that the duration of the nystagmus after turning to the left was much greater than the duration of the nystagmus after turning to the right, and that after several months the responses after turning in both directions tended to become equalized. The response in each instance was from the normal, right horizontal canal. He assumed that the results of stimulation of the normal labyrinth are the same as when both labyrinths are intact. He explained this on the basis of Ewald's law. Turning to the left causes the flow of endolymph in the right horizontal canal in a direction toward its ampulla, or ampullopetal, while turning to the right causes the flow of endolymph in the right horizontal semicircular canal in a direction away from its ampulla, or ampullofugal. He, therefore, believed Ewald's law to be physiologically applicable to man.

In their papers on the vestibular physiology, Fitzgerald and Hallpike,[4] and Cawthorne, Fitzgerald, and Hallpike [5] reported their clinical investigation on the human vestibular function. The data which they presented, of which I shall have more to say later, very strongly suggest that Ewald's law is not valid in man. Despite this, Ewald's law is still generally regarded as valid in man, as is evidenced by McNally's recent paper,[6] in which he states that Ewald's law has been generally accepted as the basis for interpretation of the clinical tests of the human labyrinth. In

Read before the Philadelphia Laryngological Society, Jan. 5, 1954.

From the Department of Otolaryngology, University of Pennsylvania School of Medicine.

* References 1 and 2.

many cases of unilateral Ménière's disease, i. e., labyrinthine hydrops, the data obtained after stimulating the horizontal semicircular canals with the turning or centrifugal stimulus suggest impairment of function of the horizontal canal on the same side as the cochlear symptoms, in keeping with Ewald's law; the cold caloric stimulus, however, evokes a poor response from the opposite vestibular apparatus and a relatively good response from the vestibular mechanism homolateral to the cochlear-deafened ear. This contradiction by the cold caloric test of the inference drawn from the turning test further suggests that Ewald's law is not valid in man and that it can be explained on the basis of the physiologic vestibular concept suggested by Cawthorne, Fitzgerald, and Hallpike.

It is the purpose of this paper to point out from some of the clinical data of Fitzgerald and Hallpike and of Cawthorne, Fitzgerald, and Hallpike that Ewald's law is not physiologically valid in man but that it is only apparently so under certain pathological conditions, and then only temporarily so. However, the explanation suggested by Ewald and supported by Bárány's clinical observations that the cilia of the vestibular end-organ cells in the crista ampullaris respond maximally to a unidi-

Fig. 1.—Diagram of the horizontal semicircular canal in a vertical plane when the head is bent back 90 degrees, so that an imaginary line from the external canthus of the eye to the tragus is in a true vertical plane.

rectional flow of endolymph is incorrect. It is also my objective to offer an explanation, based on Fitzgerald, Hallpike, and Cawthorne's newer conception of the vestibular physiology, for confusing vestibular data in the above-mentioned cases of Ménière's disease.

In their paper, Fitzgerald and Hallpike [4] reported a revised quantitative caloric technique for stimulating the horizontal semicircular canals. They used this technique on 50 normal adults, in 20 proved cases of brain tumor, 10 of which were localized in the temporal lobe, and on a series of patients believed to be afflicted with hydrops of the labyrinth. In their second paper, in collaboration with Cawthorne,[5] they reported the use of this technique on nine patients with hydrops of one labyrinth before and after unilateral labyrinthectomy had been performed. The technique is briefly as follows: With the patient lying on his back, each ear is douched for 40 seconds with cool water, at 30 C. (7 C. below normal body temperature), and with warm water, at 44 C. (7 C. above normal body temperature). With the unaided eye, the time from the beginning of the caloric stimulation to the end of the resultant nystagmus is noted with a stop watch. The cold water causes a flow of endolymph in the horizontal semicircular canal in a direction away from

its ampulla, i. e., ampullofugal; the hot water causes a flow of endolymph toward its ampulla, i. e., ampullopetal (Fig. 1). In 80% of the normal subjects, the cold reactions were in excess of the warm reactions, usually by 5 to 15 seconds, with a maximum difference of 30 seconds (Fig. 2). In 10%, the cold and hot reactions were more or less equal, and in 10% the warm reactions exceeded the cold reactions, with a maximum difference of 15 seconds. If Ewald's law is physiologically valid in man, then the warm reactions should always exceed by far the cold reactions, since the warm reactions cause a flow of endolymph in the horizontal semicircular canal in a direction toward its ampulla. Careful analysis of the data obtained from the application of this technique in the cases of temporal lobe tumor (Fig. 3) and in a large series of cases of Ménière's disease (Fig. 4) gives further suggestion that Ewald's law is not valid in man. In the 10 cases of temporal lobe tumor, it was found that the nystagmus toward the side of the tumor, resulting from stimulation of the opposite horizontal canal with cold water and the homolateral horizontal canal with warm water, was greater in duration than the nystagmus toward the unaffected temporal lobe, the latter being obtained by stimulating the opposite horizontal canal with hot water and the homolateral horizontal canal with cold water. This they designated as a directional preponderance of the nystagmus toward

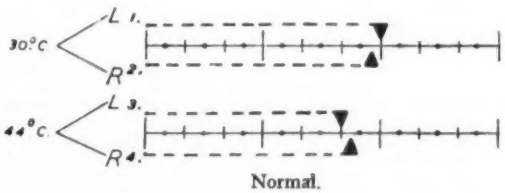
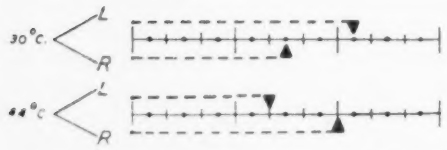
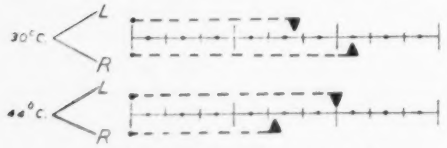


Fig. 2.—Calorigram representing normal vestibular responses. Each small division on the solid horizontal line represents 10 seconds, the larger vertical lines, one minute. An ampullofugal flow of endolymph yields a maximal response (in 80% of normal subjects), contradicting Ewald's law. Published by permission of the authors (T. E. Cawthorne, G. Fitzgerald, and C. S. Hallpike) and the publishers, Macmillan & Co., Ltd., London (*Brain* **65**:138 [June] 1942).

the side of the involved temporal lobe. Figure 3 shows the data obtained from two patients with right and left temporal lobe tumors, respectively. In the first calorigram, it will be observed that the eye response from the left horizontal canal to cold water and the response from the right horizontal canal to hot water are practically equal to each other and greater than the duration of the cold water response from the right horizontal canal and the hot water response from the left horizontal canal. The latter two nystagmic responses are to the left and almost equal to each other in duration. It will be further observed in these cases of temporal lobe tumor that the responses from the left and right horizontal canals to cold and hot water stimulation respectively are practically equal in duration, even though a flow of endolymph in each semicircular canal is opposite in direction with respect to the ampulla. In other words, the response from an ampullofugal flow of endolymph in one horizontal canal is practically equal to the response from an ampullopetal flow of endolymph in the opposite horizontal canal. While it may be argued that a patient with a temporal lobe tumor is not a normal vestibular subject, it may be equally well argued that a temporal lobe tumor certainly has no effect upon the vestibular end-organs and that whatever changes are here noted in the vestibular responses are due to changes in the central vestibular mechanism. In many of their cases of



—Directional preponderance to the right.

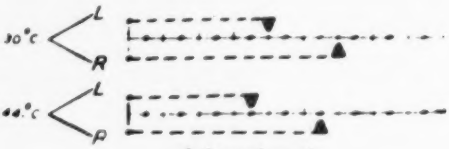


—Directional preponderance to the left.

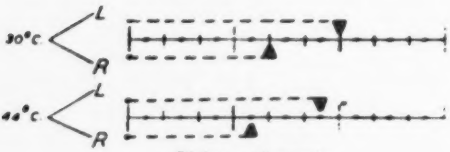
Fig. 3.—Upper calorigram: Directional preponderance of the nystagmus to the right. This calorigram was obtained from a patient with a right temporal lobe brain tumor. A similar calorigram is obtained in cases of Ménière's disease involving the left utricle.

Lower calorigram: Directional preponderance of the nystagmus to the left, obtained from a patient with a left temporal lobe brain tumor. A similar calorigram is obtained in cases of Ménière's disease involving the right utricle.

It can be observed that with a directional preponderance of the nystagmus to the right, an ampullopetal flow of endolymph in the right horizontal canal yields a maximal response, in keeping with Ewald's law, while an ampullofugal flow of endolymph in the left horizontal semicircular canal produces a maximal response, contradicting Ewald's law. This further shows that the cilia of the vestibular end-organ cells do not respond to a maximal degree when the endolymph flows toward its ampulla. It also suggests that a maximal response is due to central vestibular changes. Published by permission of the authors (T. E. Cawthorne, G. Fitzgerald, and C. S. Hallpike) and the publishers, Macmillan & Co., Ltd., London (*Brain* **65**:138 [June] 1942).



—Left canal paresis.

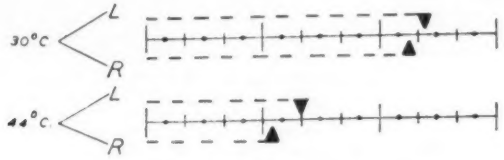


—Right canal paresis.

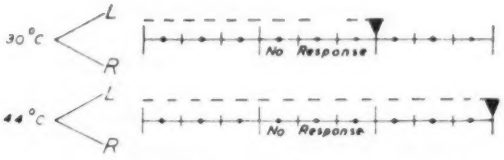
Fig. 4.—Upper calorigram from a patient with a left labyrinthine hydrops; lower calorigram, from a patient with a right labyrinthine hydrops.

It will be observed that with a reduction of the irritability of the vestibular end-organ in the horizontal semicircular canal, the responses to cool and warm water (which produce an ampullofugal and an ampullopetal flow of endolymph respectively) bear the same time relationship to each other as occurs with the normal horizontal semicircular canal. Published by permission of the authors (T. E. Cawthorne, G. Fitzgerald, and C. S. Hallpike) and the publishers, Macmillan & Co., Ltd., London (*Brain* **65**:138 [June] 1942).

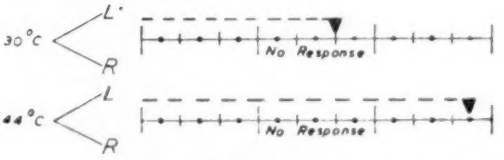
Ménière's disease in which the utricle was believed to be involved, a similar directional preponderance of nystagmus was also observed, but the preponderant direction of the nystagmus was toward the normal labyrinth. In such cases, on the affected side, e. g., the right side, the cold water response will be greater in duration than the hot water response, and on the normal side the hot water response will be greater than the cold water response. In each of these pairs of reactions, the nystagmus toward the left side, or the normal ear, will be greater in duration. It will also be noted that on the affected side the cold stimulus, which produces an ampullofugal flow of endolymph, gives a greater response than the hot water, which produces an ampullopetal flow of endolymph, while on the normal side



Reactions before operation.



Reactions three weeks after right labyrinthectomy.



Reactions 30 weeks after right labyrinthectomy.

Fig. 5.—Calorigrams of a patient showing a mild paresis of the right horizontal semicircular canal (Ménières disease) before and after a right labyrinthectomy. It will be observed that before labyrinthectomy the cool water response in the left, or normal, ear exceeds the warm water reaction. After labyrinthectomy the warm water reaction exceeds the cool water reaction, showing a change in the "physiology" of the normal vestibular apparatus due to central vestibular compensatory changes. Published by permission of the authors (T. E. Cawthorne, G. Fitzgerald, and C. S. Hallpike) and the publishers, Macmillan & Co., Ltd., London (*Brain* **65**:138 [June] 1942).

the opposite takes place; that is, the ampullopetal flow of endolymph produces a greater response than the ampullofugal flow of endolymph. Restating this in another way, on the affected side Ewald's law does not apply, and on the normal side Ewald's law does apply. Here, again, the contradiction noted upon applying Ewald's law on the two sides cannot be explained on the basis of the altered physiology of the affected labyrinth, but it can be explained on the basis of the compensatory vestibular changes in the brain stem. Jongkees,[7] using a variation of the Fitzgerald-Hallpike caloric technique, reported a directional preponderance of the nystagmus in 16.6%

of normal subjects. This bears further testimony that Ewald's law is not valid in man. As noted above, a calorigram demonstrating a directional preponderance of nystagmus reveals that in the horizontal semicircular canal on the homolateral side as the preponderant direction of the nystagmus, Ewald's law applies, while in the contralateral horizontal semicircular canal Ewald's law is contradicted or invalidated.

In the nine cases of Ménière's disease in which unilateral labyrinthectomy was performed, Cawthorne, Fitzgerald, and Hallpike observed that the ampullopetal flow of endolymph produced a much greater response than did the ampullofugal flow of endolymph in the normal horizontal canal, whereas prior to operation the ampullofugal flow of endolymph in the normal horizontal canal caused a greater response than did the ampullopetal flow of endolymph (Fig. 5). This would indicate that after labyrinthectomy Ewald's law applies to the normal labyrinth, but this is only apparent, and temporarily so, since further observation in these patients, over a period of 17 months, revealed that the responses to hot and cold stimulation tended

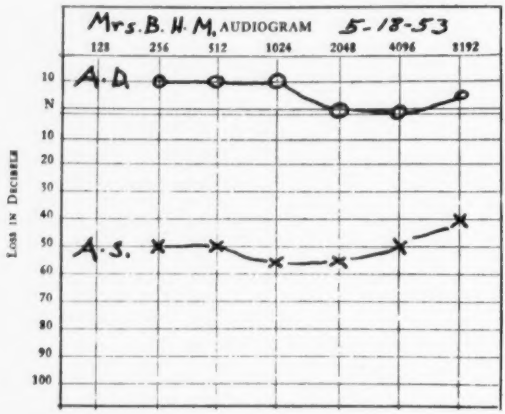


Fig. 6.—Audiogram of a 48-year-old white woman with Ménière's disease; left labyrinth.

to become equalized. Furthermore, this cannot be explained on the basis of any postoperative change in the normal labyrinth. We do know, from the work of Spiegel and Démétriades,[8] that after destruction of one labyrinth, compensatory changes take place in the vestibular nuclei in the brain stem on the same side as the destroyed labyrinth and that complete compensation for the destroyed labyrinth is not accomplished until several months have elapsed. It is therefore obvious that following labyrinthectomy, there is a change in the physiology of the normal vestibular apparatus and that the apparent application of Ewald's law in the normal labyrinth is not in any way related to the directional flow of the endolymph in the semicircular canals but that it must be due to the compensatory changes that are taking place in the brain stem.

Clinically, most otologists use a single caloric stimulus, usually the cold, in their routine vestibular examinations. I have observed occasionally that some patients with Ménière's disease give a better response to the cold caloric stimulus in the affected ear than in the normal ear, while the turning test indicates the reverse.

This was always puzzling to me. It is in part because of this paradox that the lateralization of the lesion in Ménière's disease is sometimes made largely from the history and cochlear examination rather than from the vestibular examination. The comprehension of the newer conception of the vestibular physiology will help to explain the paradoxical data obtained with cold caloric stimulation and the turning tests in

Fig. 7.—Vestibular data of same patient as that in Figure 6 with turning and cold caloric (water at 68 F.) mass stimulation.

some of our cases of Ménière's disease. The following case of Ménière's disease illustrates this point: Mrs. B. H. M., a white woman, age 48, complained of recurrent spells of vertigo, tinnitus, and deafness in the left ear over a period of two years (Figs. 6 and 7). The responses to turning to the left were decidedly better than the responses after turning to the right. Turning to the left causes an ampullopetal flow of endolymph in the right horizontal semicircular canal, and since the

responses after turning to the left are better than the responses after turning to the right, Ewald's law would suggest that the right horizontal canal functions normally and that the left horizontal canal is hypoactive. If this explanation is correct, then we should anticipate a better caloric response from the right labyrinth than the left. Actually the left labyrinth responded to one minute of stimulation with water at 68 F., and the right labyrinth responded to two minutes of similar stimulation. It is obvious that this paradox cannot be explained on the basis of Ewald's law—it can be explained on the basis of a directional preponderance of the nystagmus to the right or to the normal ear. Thus, turning to the left causes an ampullopetal flow of endolymph in the right horizontal canal and a nystagmus to the right. Stimulation of the left, or affected, labyrinth with cold water causes an ampullofugal flow of endolymph in the left horizontal canal and a nystagmus to the right. With the caloric stimulus, as with the turning stimulus, the responses to the right (i. e., in the direction of the normal ear) are better than the responses to the left. The preponderance of the nystagmus to the right, or normal, ear can be explained on the basis of the compensatory changes in the left central vestibular mechanism resulting from damage to the left peripheral vestibular end-organ. It cannot be explained on the basis of a directional flow of endolymph in the horizontal semicircular canal of the normal ear in accordance with Ewald's law.

SUMMARY

Ewald's law is stated.

The Fitzgerald-Hallpike caloric technique of vestibular examination is briefly described.

The results of these authors in their application to normal subjects, in cases of Ménière's disease with and without damage to the utricle, and in 10 proven cases of temporal lobe brain tumor are given, revealing that Ewald's law is not physiologically valid in man. In collaboration with Cawthorne, vestibular examination with this same technique of nine patients suffering from Ménière's disease before and after unilateral labyrinthectomy revealed a postoperative change in the physiology of the remaining normal vestibular mechanism—this change in physiology being due to central vestibular compensatory phenomena.

The fact that an alteration of the physiology of the opposite vestibular apparatus also results when one labyrinth is destroyed or altered by disease or experimental surgery was unknown to either Ewald or Bárány.

A comprehension of the Cawthorne, Fitzgerald, and Hallpike concept of the vestibular physiology explains the paradox encountered in certain cases of Ménière's disease in which the data obtained from the turning tests and cold caloric stimulation cannot be logically explained on the basis of Ewald's law.

CONCLUSIONS

The cilia of the vestibular end-organ cells in the ampullae of the semicircular canals normally respond equally to a bidirectional flow of endolymph.

After a unilateral labyrinthectomy, the physiology of the opposite vestibular mechanism is altered and Ewald's law apparently applies, but temporarily so and only until full vestibular compensation becomes established. This postoperative change in the vestibular physiology is due to central vestibular compensatory phenomena and not due to changes in the vestibular end-organ.

The vestibular physiologic inferences which Ewald made were from data obtained from pigeons after experimental vestibular surgery had been performed. Such vestibular apparatuses cannot be regarded as functioning physiologically; they must be regarded as pathologically functioning vestibular mechanisms.

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DIFFERENTIAL DIAGNOSIS OF COMMUNICATION DISORDERS IN CHILDREN REFERRED FOR HEARING TESTS

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AND
EDMUND P. FOWLER Jr., M.D.
NEW YORK

CHILDREN referred for hearing tests because of a diminished or complete lack of response to spoken language show various degrees of dysfunction in their language and speech development.

In order to supply the necessary diagnostic and therapeutic data to the referring physician or agency, and in order to assure proper habilitative measures, a detailed examination is necessary above and beyond a hearing test. Since language and speech functions depend upon the action and interaction of peripheral and central organs within a frame of emotional equilibrium, defects or dysfunctions in any one of these areas may constitute causative or contributory factors in the clinical picture of the child referred for a hearing test because of deficient functions of communication.

This paper presents the results of a study concerned with the following problems:

1. The causative and contributory factors in the inability of a child to hear or use his hearing and the concomitant disorder of communication.

2. The frequency with which causes other than a peripheral hearing loss are found in a group of children referred for the testing of hearing because of disorders of communication.

3. The development of a practical clinical method to obtain a reliable diagnostic impression through a language and speech evaluation.

This study was conducted at the Speech and Hearing Clinic, Columbia-Presbyterian Medical Center. All children who were referred for hearing tests because of impaired or absent language and speech development from June 1, 1952, until July 31, 1953, were included in the study. Children referred for hearing tests because of acute ear infections or surgery and children with language and speech disorders referred to the clinic without having been suspected of a hearing loss were not included.

A total of 156 children, consisting of 85 boys and 71 girls, were used in the study. Their ages ranged from 9 months to 13 years and were distributed as follows:

Age, Yr.	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13
Children, No.	1	5	21	33	27	24	21	9	7	4	1	1	2

From the Department of Otolaryngology, Columbia-Presbyterian Medical Center, supported in part by the Charles Hayden Fund for the Coakley-Memorial Clinic.

Speech Pathologist, Speech and Hearing Clinic, Columbia-Presbyterian Medical Center (Mr. Kastein); Director, Department of Otolaryngology, College of Physicians and Surgeons, Columbia University (Dr. Fowler).

All the children were given a routine audiometric test by an audiologist. They were then seen by the speech pathologist for a complete diagnostic language and speech evaluation. A diagnostic language and speech evaluation form, designed for this study, was used in all cases, and data obtained during the interview were recorded. The diagnostic language and speech evaluations were completed in one and, in some instances, two sessions, not exceeding one hour each. The children were then referred to the child audiologist * for auditory training and testing, which was completed in two to four sessions of 30 to 40 minutes each. Thus the speech pathologist was part of a team in close collaboration with the child audiologist.

The data derived from the diagnostic language and speech evaluation forms were collated and constitute the basis of this study.

As indicated on the evaluation form below, the interview was divided into two parts: I, information obtained from the parent, usually the mother; II, observations and a battery of tests given by the examiner to each child.

A complete developmental history was solicited from the mother to complement the medical history. Specific questions in regard to prenatal and postnatal factors were raised. Of particular diagnostic interest was the occurrence of miscarriages or stillbirths, staining, toxemia, German measles, severe colds or accidents during pregnancy, Rh incompatibility, prolonged labor, or birth trauma. Postnatal reports of erythroblastosis ("yellow baby"), asphyxia ("blue baby"), congenital malformations, and signs of paralysis or evidence of convulsions were considered pertinent. (It was interesting to note that unless specifically elicited, information about convulsions was rarely mentioned. Similarly, when the mother was asked about diseases and surgery, tonsillectomy and adenoidectomy were usually omitted.)

In order to interpret the child's functions of speech, familial patterns of handedness, hearing and speech disorders, and language environment were investigated. The mother's observation on the child's preference for the right or left hand was noted (Hand used).

The onset of sitting, walking, and speech were traced (Motor development), with particular stress on the first evidence of meaningful speech. "When did the child say the first words that meant what he said?" became a routine question, as well as "When did he first put words together into sentences?" and "Could strangers understand him?" or "Did you have to interpret what he said?"

Toilet, feeding, and dressing habits (Social development) were determined by appropriate questions. Sleeping and eating habits as well as the mother's description of the child's behavior were taken down as reported and supplementary information was obtained by questions such as "Does he have nightmares?" "Does your child walk in his sleep?" "What is his diet—strained foods, bottles—or can he eat and does he eat everything provided for him?" "How would you describe the child's behavior? Is he quiet or wild? Does he have temper tantrums, or does he occasionally destroy things around him?"

The next, and perhaps the most crucial, question was "How do you know what the child wants?" (Communication). The mother's responses of "He tells me," "He uses gestures," "He uses pantomime," "He cries," "He pulls," or "He points" were diagnostically significant, as was the remark "He never seems to want anything."

* Sylvia Morgan, M.A., Child Audiologist, Speech and Hearing Clinic.

COLUMBIA-PRESBYTERIAN MEDICAL CENTER
SPEECH AND HEARING CLINIC

Diagnostic Evaluation of Language and Speech Functions

NAME: BIRTHDATE: AGE:
ADDRESS: REFERRED BY:
TEL. NUMBER:

I. HISTORY

Siblings:
Handedness in family:
Hearing and speech disorders in family:
Language background:

Pregnancy:
Delivery:
Patient's Motor development:
Sat up:
Walked:
Motor skills:
Illnesses:
Said words:
Said sentences:
Social development:
Toilet trained:
Feeds himself:
Dresses himself:
Communication:
How are wants conveyed?
Family's impression of hearing speech:
Family's impression of sight:
Family's impression of intelligence:
Education:
Sleeping habits:
Eating habits:
Behavior:
Noise:

II. EXAMINATION: General impression:
General motor function:

Language: Symbol behavior
recognition of pictures
looking
pointing
naming
matching

Auditory: Comprehension of speech:
recognition of sounds:

Visuo-motor function:
Hand used:
Figure-background, gestalt perception:
(Tests: Seguin Form Board, Goodenough Drawing, Bender Gestalt, Marble Board)
Speech: Muscle functions of articulators:
Articulation of speech sounds and words in repetition:
Spontaneous speech:
Repetition of nonsense syllables:
Repetition of digits:
Voice:
Communication:
Behavior:

Additional observations:

IMPRESSION:
RECOMMENDATIONS:
DATE:
SIGNATURE:

The parent's impression of the child's ability to hear speech and noises was obtained with the specific questions, "What do you, as a mother, think of the child's hearing, regardless of what has been told to you by others" and "When did it first occur to you that your child may not hear well?" The parent was also asked "What is your impression of the child's functions? Do you think that he is up to his age intellectually? Does he seem advanced or slow to you?" It is important to obtain the parent's objective impression, since it is frequently more revealing than previous test results and diagnoses. It may also suggest parental attitudes of rejection, overprotection, or unrealistic interpretations when compared with the examiner's observations or the child's test responses during the interview. Educational (group) experience was noted and adjustment or achievement in the group (school) discussed.

The second part of the evaluation interview (II) concerned appearance, motor functions, interpersonal relationships and behavior of the child, as well as receptive and expressive language and speech functions and responses to a battery of tests. The child was seen alone or in the presence of the mother when she was needed to elicit responses.

The observed relationship between mother and child, such as evidence of rejection, dependence, aggression, or hostility, the child's tendency to withdraw, his apparent lack of contact with the environment, or a lack of curiosity and awareness of the environment were all important diagnostic clues.

The child's symbol behavior (Language), perception and comprehension of visual and auditory stimuli were tested. Large pictures of simple objects, selected to fit the child's age and living experience, were used to test recognition by looking, pointing, or associating the picture with a corresponding object. Thus identification of the picture of a ball with a ball, of the picture of a baby's shoe with the child's own shoe, etc., could be elicited by pantomime without the use of speech sounds. Recognition of objects and their uses could be observed in a similar manner, as well as the ability to match identical pictures.

Hearing, comprehension, and use of spoken language were investigated by observing the child's ability to look at, point to, or select a picture named by the examiner. At the same time, attempts at lipreading were observed, as were changes in the child's responses when the examiner's voice was raised. Responses to questions and simple commands and comprehension of connected speech were observed. In very young children, the mother's voice was sometimes used and responses to her speech observed. On occasion, a concealed music box, keys, or a telephone bell were used to observe the reaction to sound and noises. If hearing loss appeared to be a factor, a small hearing tube was used and sounds or words fed directly into the meatus of the ear. Thus differences in the acuity of hearing between the right and the left ear could be detected, the effect of focusing on auditory stimuli observed, and an impression of the child's reaction obtained.

Since orientation in spatial relationships, as well as visuomotor functions and gestalt perception, is an integral part of general and language development, a battery of tests was included in each diagnostic interview as standard procedure, providing it could be administered. The Seguin Form Board,[1] Goodenough Drawing of a Man,[2] Bender Visual Gestalt,[3] and the Marble Board [4] tests were used. Responses were evaluated qualitatively, not quantitatively, a procedure in contrast to the quan-

titative approach used by Myklebust in a recent study on visual perception in deaf children.[5] Responses were not timed, nor was there any attempt to calculate the measure of success. The manner in which a child approached the task, the behavior while executing it, the learning that took place after the child was shown how to do a task or had repeated it, the use of his hands, the turning to an adult for help, and the remarks such as "I can't do it" and "It is too difficult for me" were considered critical behavior items and, along with the test responses, served to support or restrain a diagnostic impression. Moreover, since responses were evaluated only from a qualitative point of view, the tests could be used and considered in children very much younger than the age group on which they had been standardized.

An exploration of the oral structure (hard palate, soft palate, and uvula) preceded the evaluation of the child's speech and voice. The motility and range of motion of the muscles of articulation were determined in order to detect deviations apt to interfere with or explain manifestations of articulatory or phonatory changes. At the same time, the tendency to drool and the ability to blow and suck were observed. Habits of thumb sucking or nail biting were also noted at this time.

Speech, when present, was tested by repetition of words containing all speech sounds in various positions (initial, medial, and final). Spontaneous speech, when present, was elicited and differences from repetitive speech noted. Jargon, poor sentence structure, agrammatism, perseveration, echolalia, and slurring often contributed clues toward final diagnostic impressions. Repetition of nonsense syllables and digits indicated the child's auditory memory span and linguistic maturity.

The voice was considered equally important, since deviations could indicate specific pathologies. Observation was made of the "flat" voice; the fading, nasal voice; the high-pitched, whining voice, and so on.

The general attitude of the child toward communication, his readiness to initiate speech as a means of communication, excessive verbal output, pantomime, or a complete lack of any attempt to communicate were all considered important factors, as was the behavior of the child during the interview. Attention was thus focused on possible indications of mental retardation, autistic tendencies, emotional disturbance, or brain injury by such behavior as lack of curiosity, lack of contact with the environment, infantile behavior patterns, hyperactivity, and motor disinhibition.

Comments from the mother, spontaneously offered or in reply to questions with regard to her own problems, or observations made by the family pertaining to the child's problems were noted in the space provided (Additional observations). These often served to fill the gap left by unexplained observations.

The diagnostic impression was based on the integration of observations, notes, and test results.

Once a diagnostic impression had been established, recommendations for further examinations or tests as well as training or educational management of the child were made before he returned to the referring physician or agency.

The validity of the initial diagnostic impression, as stated on the Language and Speech Evaluation Form, had been confirmed in almost all cases by subsequent neurological and psychiatric consultations, as well as by repeated audiometric and psychometric tests. Moreover, since many of the children have been followed for therapy, responses to therapy further corroborated the initial qualitative diagnostic impressions. It is noteworthy and indicative of the effectiveness of the procedure that

the impressions gained during the diagnostic language and speech interview, without audiometry or psychometry, were subsequently confirmed by formal tests. It is of further interest to note that the initial audiometric test results were different from both the diagnostic impression of the speech pathologist and the findings of the child audiologist, whose records during or after auditory training showed a reduction of thresholds in most cases. Apparently, the initial audiogram showed the functional, not the physiological, threshold of hearing in many of the children. Thus the qualitative language and speech evaluation has proved a reliable differential diagnostic tool.

As the data on the evaluation forms were further analyzed and tabulated, a specific pattern emerged, clearly outlining the following profiles:

Hearing Loss

- Symbol behavior: good
- Spatial orientation: good
- Visuomotor functions: fair
- Figure background perception: poor
- Handedness: preference established
- Communication: pantomime; lipreading (spontaneously)
- Voice: flat
- Better responses to stronger auditory stimuli
- Parent able to state when hearing dysfunction was first apparent; specific noises child could hear (airplanes, fire engines, dogs barking)

Hearing Loss and Brain Injury

- Symbol behavior: poor
- Spatial orientation: poor
- Visuomotor functions: poor
- Figure background perception: poor
- Handedness: no specific pattern
- Communication: pantomime; little attempt at lipreading
- Voice: no specific pattern
- Short attention span
- Hyperactivity; motor disinhibition
- Temper tantrums; bed rocking

Hearing Loss and Mental Retardation

- Symbol behavior: none
- Spatial orientation: none
- Visuomotor functions: none
- Figure background perception: none
- Handedness: no specific pattern
- Communication: little spontaneous attempts of any kind; some attempt at lipreading
- Voice: husky

Hearing Loss and Emotional Disturbance

- Symbol behavior: good
- Spatial orientation: good
- Visuomotor functions: good
- Figure background perception: fair

Handedness: no specific pattern

Communication: verbal, defective articulation; little attempt at lipreading
Voice: whisper

Child appears withdrawn but can be reached; difficulty with peers reported

Central Imperception: Including the "Brain-Injured Child" and the Child with Cerebral Palsy

Symbol behavior: good for visual symbols (recognition)

Spatial orientation: attempted with aid of kinesthetic sense (feeling contours)

Visuomotor functions: poor

Figure background perception: poor

Handedness: preference established

Communication: jargon; echolalia; perseveration; no lipreading; poor or no comprehension of spoken language

Poor auditory attention; better comprehension when attention paid; better comprehension for single words than sentences

Considered deaf by parents

Poor balance, poor coordination additional factors in some cases

Aphasia, Acquired

Loss of speech after at least some normal development reported

Symbol behavior: poor (anomia)

Spatial orientation: poor

Visuomotor functions: poor

Figure background perception: poor

Handedness: use of better hand

Communication: jargon; gestures; some perseveration

Voice: good

Poor imitative behavior, including speech

Restless; hyperactive

Congenital Word "Deafness"

Symbol behavior: excellent visual symbol recognition; poor auditory symbol recognition

Spatial orientation: good

Visuomotor functions: good

Figure background perception: good

Handedness: preference established

Communication: jargon; rejection of speech as means of communication, although responding to all sounds; blank look when listening to speech

No retention of auditory stimuli

Inconsistent responses to auditory stimuli

Rejection of any attempt at speech training

Mental Retardation, Primary and Secondary

Symbol behavior: none

Spatial orientation: none

Visuomotor functions: none

Figure background perception: none

Handedness: ambilaterality

Communication: pulling; crying; no pantomime; no lipreading
Voice: good
Delayed motor development; delayed social development
Little or no curiosity in environment
Head rolling; head banging reported

Emotional Disturbance

Symbol behavior: good
Spatial orientation: good
Visuomotor functions: good
Figure background perception: fair
Handedness: preference established
Communication: verbal with selected people; rejection of verbal communication with others; articulatory deficiency
Voice: good; frequently used whisper
Infantile behavior; bed-wetting; nightmares reported

Mental Illness

Rejection of test performance
or
Symbol behavior: good
Spatial orientation: good
Visuomotor functions: poor
Figure background perception: rarely elicited
Handedness: ambilaterality or use of both hands at once
Communication: no response to spoken language; no lipreading; no attempt at communication; may take hand of parent or adult to point or take food and objects
Voice: shrieks
Odd postures of hands; preoccupation with own hands
Lacking contact with people or environment
Good motor development and functions (climbing, jumping)
Reported love for music; singing, often with words in the absence of speech
"Enthralled by music"; "Never wants anything"; "Always been a quiet child"; "Always on the fringe"; "No contact with children"; "No contact with adults"; "Ignores people"; "Lives in a world of his own"; "Lives with his hands"; "Shows no sign of pain"
Mechanically inclined; compulsive interest in wires, locks
Parents know the child can hear

Tabulation of the data on the evaluation forms of the 156 children comprising this study showed the distribution of diagnostic findings found in the Table.

These findings seem important not only in regard to the diagnosis of disorders of communication in children who are suspected of having a hearing loss but also because they can be applied to all children with impaired language and speech development. Furthermore, this practical clinical method for obtaining a differential diagnostic impression will provide the much-needed basis for guidance in the training and education of children with disorders of communication. If children are classified merely as deaf and so treated while actually they may be brain-injured, retarded,

or emotionally disturbed, with or without hearing loss, they will not receive the training that might enable them to develop to their full potential in any area of function.

Since language and speech are the basis of intellectual development, the child with impaired or absent functions of communication is caught in a vicious circle of impaired language, causing impaired intellect and depressed functions of intelligence and emotional-social development, which, in turn, prevents language from developing further. Rather than wait, therefore, until the child is "ready" to talk, it is imperative that the cause of the delay be investigated and adequate training offered at a time when language would develop normally, that is after the second year of life.

Distribution of Diagnostic Data on 156 Children Referred for Hearing Tests Because of Impaired or Absent Language and Speech Development

Diagnosis	Children, No.
Hearing loss *	54
Hearing loss and brain injury	7
Hearing loss and mental retardation	9
Hearing loss and emotional disturbance	11
	27
Central imperception	19
Aphasia, acquired	3
Congenital word "deafness"	3
Mental retardation	23
Emotional disturbance	11
Mental illness	13
	75
Total	156

* Two children of the 54 had no residual hearing; 6 children had losses of 80 db. or above.

Helen Keller [6] is the one human being best qualified to teach us what lack of language means in terms of human growth. Her life bears witness and her own words describe the awakening of the mind with the grasp of langua .†

I was nearly seven years old when I began to acquire language, and I remember distinctly the feelings I experienced. . . . All at once there was a strange stir within me—a misty consciousness, a sense of something remembered. It was as if I had come back to life after being dead: I understood that what my teacher was doing with ' fingers meant that cold something that was rushing over my hand and that it was possible for me to communicate with other people by these signs. It was a wonderful day never to be forgotten! Thoughts that ran forward and backward came to me quickly—thoughts that seemed to start in my brain and spread all over me. Now I see it was my mental awakening. I think it was an experience somewhat in the nature of a revelation. I showed immediately in many ways that a great change had taken place in me. I wanted to learn the name of every subject I touched, and before midnight I had mastered thirty words. Nothingness was blotted out. I felt joyous, strong and equal to my limitations! Delicious sensations rippled through me, and swee' strange things that were locked up in my heart began to sing. The first revelation was worth all those years I had spent in dark, soundless imprisonment. That word "water" dropped into my mind

† Keller, H.: My Religion, copyright 1927 by Doubleday & Company, Inc., quoted by permission of publishers.

like the sun in a frozen winter world. Before that supreme event there was nothing in me except the instinct to eat and drink and sleep. My days were blank without a past, present or future, without hope or anticipation, without interest or joy.

SUMMARY

This paper presents the results of a study concerned with the following problems:

1. The causative and contributory factors in the inability of a child to hear or use his hearing and the concomitant disorder of communication.

2. The frequency with which causes other than a peripheral hearing loss are found in a group of children referred for the testing of hearing because of disorders of communication.

3. The development of a practical clinical method to obtain a reliable diagnostic impression through a specially designed language and speech evaluation procedure, administered by the speech pathologist working as a team in close collaboration with the child audiologist and the otologist.

This study comprises 156 children who were suspected of having a hearing loss because of impaired or absent language or speech development. It does not include children referred for hearing tests because of acute ear infections or surgery.

Analysis of the data obtained from the diagnostic language and speech evaluation procedure resulted in specific patterns clearly outlining diagnostic profiles.

Tabulation of the diagnostic findings showed the following distributions: From the total of 156 children used in this study, 54 had a peripheral hearing loss. Twenty-seven children had a peripheral hearing loss accompanied by brain injury, mental retardation, or emotional disturbance. Seventy-five children had no peripheral hearing loss at all. Rather, central imperception, acquired aphasia, word "deafness," mental retardation, emotional disturbance, or mental illness, respectively, was found to be the causative factor in the responses to auditory stimuli and dysfunction or lack of communication in this group of children.

The importance of a differential diagnosis in children with suspected hearing loss and disorders of communication is stressed in view of the need for adequate training of language at an early age, so that they may be helped to develop to their full potential.

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CANCER OF THE LARYNX

I. General Data and Symptoms—A Review of 1,498 Cases

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DURING the 25-year period 1928-1953 there were 1,498 cases of cancer of the larynx seen in the bronchoscopic clinic of the Jefferson Hospital. Of this number, 1,442 were verified histologically. Fifty-eight of the patients had two or more primary lesions. Although there are many variable factors encountered in any large series of cases, some can be eliminated in this group, since all the records have been kept in a uniform manner for the entire period and the management of the patients has been under the direction of one person, Dr. Louis H. Clerf. It is extremely hazardous to attempt to arrive at any final decisions on the basis of data from one source. This report serves to place statistical material on record so that, when considered with that from other sources, more knowledge of laryngeal carcinoma may be gained. No valid statistical conclusions about the disease can be drawn from this series alone.

INCIDENCE

Whereas 84 patients were seen with this disease during the five-year period 1928-1933 and 450 cases from 1934 to 1943, there were 964 cases from 1944 to 1953.

Comparison with the total number of patients admitted to the bronchoscopic clinic for these periods indicates an increased incidence from 0.24% for the first 5 years, to 0.66% for the next 10 years, to 1.7% for the last 10 years, which is an almost uniform tripling for each period and signifies that the disease was encountered seven times as frequently in the past 10 years as it was 25 years ago. This increase is more striking when it is considered that cancer of the larynx was diagnosed and treated in relatively few clinics 20 years ago, whereas in the past decade the disease was handled in almost all parts of the country and by most qualified laryngologists. While this expansion parallels that of lung cancer to some extent and may be a part of the general increase in respiratory tract cancer, the greater ratio does not nearly approximate the phenomenal increase of bronchogenic carcinoma during this time. Whether or not this progressive increase of carcinoma of the larynx is real and absolute cannot be definitely answered, for the greater number of cases may simply reflect the fact that more patients with laryngeal cancer were referred to the clinic for diagnosis and treatment during the past decade than formerly. If this increase is found generally throughout the country, it would substantiate the as yet unproved assumption that cancer of the larynx is occurring more frequently.

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AGE

In this series the age distribution of carcinoma of the larynx was similar to that of other carcinomas, with the greatest frequency in the fifth, sixth, and seventh decades (85%) and with the largest number occurring in the sixth decade (37%) (Table 1). While the everage was 58.9 years, the disease was occasionally encountered in both extreme age periods, the youngest patient being 18 years of age and the oldest 88.

SEX AND RACE

It has long been recognized that laryngeal carcinoma is predominantly a disease of males, although no satisfactory explanation for the sex descrepancy has been promulgated. In this group there were 1,390 males (92.8%) and 108 females

TABLE 1.—*Age Distribution* of Patients with Larnygeal Cancer*

Period	Patients, No.	Age, Yr.							
		Under 20	20-29	30-39	40-49	50-59	60-69	70-79	80-89
1928-1933	84	0	4	5	15	35	18	5	0
1934-1943	450	0	3	21	90	166	125	36	7
1944-1953	964	1	2	28	136	356	314	113	11
Total	1,498	1	9	54	241	557	457	154	18

* In seven cases no age was listed.

TABLE 2.—*Distribution of Patients with Laryngeal Cancer According to Nationality*

Nation	Patients, No.	Nation	Patients, No.
United States	1,135	Turkey	2
Russia and the Baltics	148	Syria	2
British Isles	64	Puerto Rico	2
Italy	64	Holland	1
Germany and Austria	63	Peru	1
Scandinavia	4	Palestine	1
Greece	4	France	1
Spain	3	Cuba	1
Switzerland	2		

(7.2%), a ratio of 13 to 1. Of these, only 17 (1.1%) were Negroes. This is a smaller percentage than among patients in the tumor clinic, where, over a 10-year period, the total number of malignant cases registered (excluding blood dyscrasias) was 5,419, of which 466 (9.4%) were Negroes. This difference in the percentage of Negro patients does not seem significant and, probably, merely indicates that only a small number of Negro patients with carcinoma of the larynx were referred to the bronchoscopic clinic.

NATIVITY

Eleven hundred thirty five (76%) of the patients were native born, the majority being from Pennsylvania and the adjoining states. The 363 (24%) foreign born were almost entirely from Europe and the Near East (Table 2). No striking predilection for any one location in foreign countries was found. The greatest number of the foreign-born patients were from the Baltic region (40%), and next in frequency were the central and southeastern European countries and the British Isles (18% each).

OCCUPATION

In the general nature of the occupation, the number in each category corresponded generally with the population statistics for these groups (Table 3). The disease was not found to develop predominantly in people in any one type of work.

TABLE 3.—*Distribution of Patients with Laryngeal Cancer According to Occupation*

Occupation	Patients, No.	Occupation	Patients, No.
Protective and service	335	Housework	73
Clerical and sales	275	Farming	61
Labor	215	Mining	58
Professional and semiprofessional	191	None or retired	108
Factory	182		

TABLE 4.—*Frequency of Cancer and the Organ Involved in Families of Laryngeal Cancer Patients*

	Cancer, Type											
Relationship to Patient	Unknown	Stomach and Abdomen	Breast	Uterus and Cervix	Larynx and Trachea	Skin	Liver	Rectum	Bowel	Mouth and Tongue	Lung	Brain
Father	23	7	..	..	3	6	3	4	..	2	1	1
Mother	21	12	23	11	..	2	3	1	3	2	1	..
Siblings	41	10	4	4	6	1	1	3	4	..	2	1
Grandparents	8	..	1	1	..	2	1	..	..	..	..	..
Aunt or uncle	9	5	1	..	4	..	..	..	1	1	..	..
Family	27	1	..	..	..	2	2	..	..	..	..	..
Total	129	35	29	16	13	13	10	8	8	5	4	2

TABLE 5.—*Distribution of Patients with Laryngeal Cancer According to Their Smoking Habits*

Smoking Habits	Patients, No.
None	186
Less than 1 pack of cigarettes daily	249
One to 2 packs of cigarettes daily	563
Two to 3 packs of cigarettes daily	152
More than 3 packs of cigarettes daily	39
Pipe and/or cigars (moderate)	55
Pipe and/or cigars (excessive)	62
Pipe, cigars, and cigarettes (excessive)	82
Unknown	110

FAMILY HISTORY

Of the 1,498 patients, 272 (19%) gave a family history of cancer. In Table 4 the relationship of the patient and the organ involved is indicated. There were 32 patients in which at least two members of the family had cancer, and in four patients three members of the family had cancer.

SMOKING HABITS

From the beginning, a reliable history has been kept of the smoking habits of the patients. The approximate amount is frequently stated, and the various categories of smokers is listed in Table 5. Of the entire number, 186 (12%) were nonsmokers. This may be of import when compared with the smoking habits of the

general population as a whole, in which 34% were found to be nonsmokers. On the other hand, it does not necessarily incriminate tobacco as an etiological agent but may indicate the role of chronic irritation in the development of cancer. Approximately 70% of the patients smoked only cigarettes. If one considers smoking a package of 20 cigarettes or more a day excessive, 52% of the patients would fall into this group.

SYMPTOMS

Of the 1,498 patients, there were 816 (54.4%) whose only symptom was hoarseness when first seen. There were an additional 468 (31.1%) whose first symptom was hoarseness. A total of 1,284 (85.5%) patients had hoarseness as the first symptom of cancer of the larynx (Table 6). The presenting symptoms

TABLE 6.—*Symptoms of Laryngeal Cancer*

	Symptoms								
Degree	Hoarseness	Sore Throat	Dysphagia	Mass in Throat or Neck	Pain	Cough	Thick Speech	Dyspnea	Weight Loss
Initial	1,284	62	43	33	13	9	8	5	2
Secondary	.....	71	200	62	290	183	24	264	106
Total	1,284	133	243	95	303	192	32	269	108

TABLE 7.—*Duration of Hoarseness Before Diagnosis of Laryngeal Cancer was Made*

Duration of Hoarseness	Patients, No.
1-3 mo	241
4-6 mo	206
7-9 mo	82
10-12 mo	114
1-1½ yr	41
1½-2 yr	69
2-3 yr	30
Over 3 yr	33
Total	816

other than hoarseness were most frequently encountered in the lesions involving areas adjacent to the larynx. In most cases, the secondary symptoms occurred in advanced cases. Many of the patients had visited one or more physicians, seeking relief of the hoarseness, and had been treated symptomatically without proper laryngeal examinations for periods up to a year prior to coming to the clinic. In Table 7 the duration of symptoms prior to the patient's being seen at the clinic and the establishment of the diagnosis is charted. Over one-half of the patients were examined during the first six mont' of their hoarseness. During the 25-year period only 49 patients were examined during the first month of symptoms.

SUMMARY

An analysis of the vital statistics and symptoms of 1,498 patients with cancer of the larynx seen at the Jefferson Hospital bronchoscopic clinic during the 25-year period 1928-1953 has been made.

Subsequent studies in preparation will be concerned with the description of the lesions, treatment, and follow-up studies.

CHEMICAL BURNS OF THE ESOPHAGUS

The Importance of Various Chemicals As Etiologic Agents in Stricture Formation

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THERE has been variable opinion as to the etiology and treatment of stricture of the esophagus as a result of chemical burns. This confusion has been not only with the general practitioner, internist, and pediatrician, but with the otolaryngologist as well. It is common knowledge that there is a greater preponderance of burns and stricture formation in the esophagus due to lye than to any other chemical. This is evidenced by the fact that a perusal of the literature discloses more articles dealing with lye alone than with all other substances.

It was my observation, on my bronchoesophageal service at the Los Angeles County Hospital, that I could not remember any case of esophageal stricture from chemical burn that was not due to lye. Accordingly, case of burns from other causes referred down to me were not given the same drastic treatment accorded those with lye ingestion. Using this policy, I have had no difficulties, although there has been skepticism as to my rationale among some members of the referring departments. Because this skepticism was also shared by some of the men on our service, I decided to review the cases of chemical burns of the esophagus at the Los Angeles County Hospital for the past five years, 1948 through 1952. One hundred thirty-one (131) cases are recorded. This review has been enlightening and, I think, bears out my premise that we have to worry only about lye as the cause of stricture of the esophagus in most cases in which the burn is caused by a common household agent. I found only one exception in the entire series. This statement may have to be modified slightly, because other cases have been reported since I started reviewing my series, but these cases are from older series, and I am considering the household chemicals available today. Stothers [6] listed three strictures due to ammonia, one due to Lysol (saponated cresol solution), one due to phenol, and one due to hydrochloric acid, in a series of 47 cases he recently reviewed. Only 66% of his stricture cases were from lye, a figure which is much lower than is usually reported. Hodge and Scharfe [3] reported 30 cases of attempted suicide with phenol, in which no strictures formed.

Collection of these data has also unearthed other interesting findings, which will be included in this paper.

During the five-year period of 1948 through 1952, 131 cases of chemical burns of the esophagus were seen at the Los Angeles County Hospital. The chemicals

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Presented as a candidate's thesis in partial fulfilment of the requirements for membership in the American Broncho-Esophagological Association.

involved are listed in Table 1. It will be noted that lye ingestion represents 48.8% of the total cases. This percentage is comparable to the figure of Stothers,[6] who reported 47% of the strictures in his series as due to lye.

Lye ingestion is commonest, there being 64 cases, or 48.8%. This finding agrees with most reports in the literature. The next commonest is Lysol, there being 29 cases, or 22.1%.

Age distribution is shown in Table 2. It is interesting to note that 29 cases, or 22.1%, occurred in the 0- to 4-year age group, while almost as many, 25, or 19%, occurred in the 30- to 39-year age group. This percentage is slightly less for the younger age group than is usually reported. However, this finding agrees with that

TABLE 1.—*Chemicals Involved in Chemical Burns in Los Angeles County Hospital During Five-Year Period*

Chemical	Cases	Percentage
Lye	64	48.8
Saponated cresol solution (Lysol)	29	22.1
Ammonia	11	
Iodine	8	
Potassium permanganate	6	
Copper sulfate (Clinitest tablets)	3	
Mercury bichloride	3	
Oxalic acid	2	
Chlorine	1	
Coal tar	1	
Liniment (methyl salicylate)	1	
Phenol	1	
Acid (undetermined)	1	
Total	131	

TABLE 2.—*Age Distribution of Patients with Chemical Burns*

Age, Yr.	No. of Cases	Percentage	Age, Yr.	No. of Cases	Percentage
0-4	29	22.1	30-39	25	19
5-9	4		40-49	17	
10-19	10		50-59	9	
20-29	19		60-69	12	
			70 plus	5	

of Hodge and Scharfe,[3] who stated that stricture of the esophagus is commonest in children, but their group, of 23 cases, showed 11 patients over 35 years of age. However, of lye burn cases alone, Kernodle and associates [4] reported 136, with 82% in the 1- to 5-year age group.

Most papers show about equal distribution between the sexes, but in the present series, as shown in Table 3, the females number 84, or 64.5%, while the males number only 46, or 35.5%. This is probably a reflection of the large 30- to 39-year age group, in which more women than men attempt suicide by ingestion of caustic chemicals.

Not all the patients with chemical burns recorded received esophagoscopy; only 69, or 52.6%, did. This probably reflects, to some extent, my feeling that not all chemical burns need esophagoscopy.

We now come to the original reason for this publication. Of the 131 cases of chemical burn of the esophagus, there were 20 cases, or 15.2%, in which stricture developed. Of the 20 strictures 19 were due to lye. Only one high stricture, in an adult, was due to another chemical, this stricture being due to ingestion of Clinitest tablets (copper sulfate). Even in this case the chemical involved is very questionable, as the source of heat energy to carry out the reaction in a Clinitest tablet is lye, which was probably the primary cause of the stricture. This stricture was so high—at the cricopharyngeus level—that I wonder whether there was not a congenital narrowing there which held the tablets concentrated in that area. None of the other chemicals listed caused stricture. There were 64 cases of lye ingestion and 19 cases of stricture, or stricture developed in 29.6% of the lye cases. These findings are shown in Table 4.

TABLE 3.—*Sex Distribution of Cases of Chemical Burns*

Sex	Cases	Percentage
Male	46	35.5
Female	84	64.5

TABLE 4.—*Incidence of Stricture in Cases of Lye Ingestion*

Chemical	Number of Strictures	Total Cases of Lye Ingestion	Percentage of Lye Cases with Stricture
Lye	19	64	29.6
Other (Clinitest tablets)	1	..	....

TABLE 5.—*Site of Esophageal Stricture*

Site of Stricture	No. of Cases	Percentage
Upper third	3	15
Middle third	3	15
Lower third	6	30
Multiple	2	10
Not recorded	6	30

The predominant site of stricture formation in this series, when the site was recorded, is in the lower third of the esophagus, where 30% of the strictures occurred. This finding differs from that of Martin and Arena,[5] who reported 50 cases of lye burn with stricture formation and only 2% in the lower third of the esophagus. Their largest number, 24%, was in the upper third. The sites of stricture for this series are given in Table 5.

Our method of treatment at the Los Angeles County Hospital for chemical burns of the esophagus, of late, has been the installation of a Levin tube immediately on admission of a patient with a fresh burn. This tube remains in at least a week, or longer. If there are severe mouth burns, the tube is left in until esophagoscopy can be done, to see whether dilatation or further use of the Levin tube is necessary. Not in all cases reviewed were the patients treated in this manner, unfortunately. This survey has brought out some interesting facts concerning the immediate installation of the Levin tube. These findings are shown in Table 6.

It will be noted that 78 patients with chemical burn had the benefit of immediate passage of a Levin tube. The time the Levin tube remained in varied from 1 day, in a moribund patient, to 70 days. Only 3 of the 20 strictures followed the use of a Levin tube, whereas 17 patients who did not have the benefit of a Levin tube developed stricture. This finding agrees with that of Gellis and Holt,[2] who advocated early treatment by dilatation, as described by Salzer, and also with an article by Crowe,[1] who advocated early dilatation by the Bokay method.

There were 11 deaths, a mortality of 8%. The causes and agents are listed in Table 7. An interesting finding was that all the mercury bichloride burns (three cases) resulted in death. Two deaths were due to necrosis, while the third resulted from kidney damage.

TABLE 6.—*Relation of Immediate Installation of Levin Tube to Esophageal Stricture*

Total strictures	20
No. of cases with Levin tube	78
No. of cases with Levin tube followed by stricture	3
No. of cases without Levin tube followed by stricture	17

TABLE 7.—*Deaths from Chemical Burns*

Agent	No. of Deaths	Percentage of All Cases	Percentage of Lye Cases	Percentage of Mercury Bichloride Cases
Lye	8	6.0	13.5	...
Mercury bichloride	3	2.3	....	100

TABLE 8.—*Type of Dilatation of Strictures*

Method	Cases
Esophagoscopy and bougie	17
Hurst mercury bougie	2
Tucker retrograde method	1

In the 20 cases of total stricture, the type of dilatation used is recorded in Table 8. Seventeen of the 20 strictures were treated by esophagoscopy and dilatation; two were treated with Hurst mercury-weighted bougies, and one was treated by the Tucker retrograde method.

SUMMARY AND CONCLUSIONS

A series of 131 cases of chemical burns of the esophagus is reviewed.

Lye burns represented 48.8% of all the cases.

There were 20 cases in which stricture of the esophagus subsequently developed.

Of the 20 strictures, 19 were due to lye burns, only 1 being due to another chemical, namely, copper sulfate. However, the copper sulfate was in the form of Clinitest tablets, which also contain lye as a source of heat energy.

It is evident from this series that burns of the esophagus needing drastic treatment do better with the immediate use of a Levin tube and early dilatation. Only 3 of the 20 strictures reported occurred when this method was used.

It would seem that the ingestion of household chemicals, other than lye, in general use today need not receive the drastic treatment given the latter, as stricture formation from their ingestion is a rarity.

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RECONSTRUCTION OF AURICLE FOLLOWING EXCISION OF A CANCEROUS GROWTH

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THE EXTERNAL ear is made up of a thin layer of elastic fibrocartilage covered with skin, which is thin and closely adherent to the enclosed cartilage. Very fine hair follicles and small sebaceous glands are contained in the skin.

Carcinoma of the skin occurs frequently after the age of 55. It is usually commoner in men than in women and occurs seven times more often in white than in Negro persons. Although the actual cause of malignant growths of the skin is unknown, they arise particularly in the exposed parts, as the ears, face, and hands. Not only sunlight, but any radioactive element predisposes to malignancy. The action of roentgen rays is well known in this relation.

Squamous-cell carcinomas occur most often on the lower lip, the nose being second in frequency and the ear third. The characteristic primary lesion is a small papule or nodule which enlarges with rapidity and soon ulcerates. The tumor mass is not encapsulated, but its borders are usually clearly delimited. They arise from the basal cells of the epidermis and differentiate to form nests of characteristic neoplastic squamous cells. Although they both arise from the basal layer of the skin, the squamous-cell carcinoma differs from the true basal-cell tumors both in cellular type and in rate of growth. The former grow rapidly—weeks or months—while the latter require months or years before reaching any considerable size. The squamous-cell tumors seldom metastasize.

REPORT OF A CASE

A woman 95 years of age noticed a small papular elevation on the upper, outer rim of the helix of her left ear. A variety of different substances were applied to the ear in an attempt to give it home treatment. Instead of decreasing in size, the nodule continued to grow larger, forming a mushroom excrescence, which began to ulcerate; and at the end of the three weeks from the time it was first noticed, it measured 2.5 by 3.6 cm. At this time, the woman was first seen by a physician. A microscopical diagnosis of squamous-cell carcinoma was made, and removal of the growth was advised.

The patient's personal history was not remarkable; her health had been considered good. The general physical and laboratory examinations were essentially negative except for emphysema of the senile type, mild nonspecific myocardial change, shown by the electrocardiogram, and arteriosclerosis. The blood pressure was 180/78.

The medical history revealed that she had had treatment for her stomach in 1903 and a paralytic stroke in 1950; there was complete loss of vision in the right eye.

The operation was performed in the hospital operating room, with the patient under local anesthesia. The customary surgical preoperative measures were carried out after the field had been infiltrated with 1% procaine hydrochloride alone; epinephrine was omitted because of the general arteriosclerotic condition of the patient at 95 years of age.

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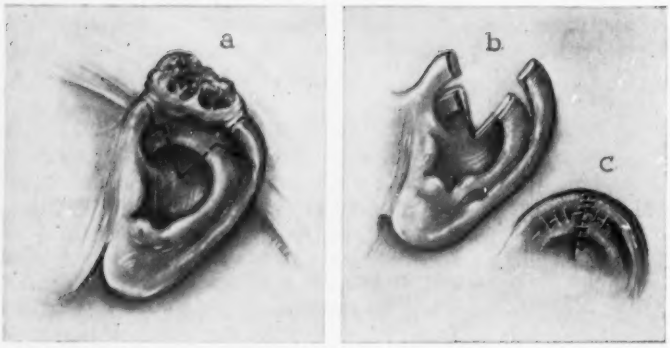

Fig. 1.—(*a*) Squamous-cell carcinoma of the helix; dotted line indicates proposed area of excision of tissue. (*b*) Tissue excised; note triangle areas removed. (*c*) Helix resutured to give nearly normal appearance.

Fig. 2.—Patient before operation.
Fig. 3.—Patient after operation.

A wide wedge of tissue including the base of the growth was excised from the edge of the auricle after the making of the primary incision and the undermining of the skin. To reconstruct the natural contour of the helix, a small triangular piece of tissue was excised from each arm of the primary wedge. The borders of these two secondary excisions were closed first, to maintain a curve. This was followed by closing the first large wedge-shaped tissue defect, made by removal of the tumor. Interrupted nonabsorbable surgical (silk) sutures, 0000, were used throughout the procedure.

The operation wound was drained by the use of a small rubber dam inserted in the posterior surface of the ear. A pressure dressing was applied over all, and the patient left the operating room in good condition.

The result of the operation was satisfactory, particularly when the age of the patient is considered. The senile state of the skin of the face is indicated by the general crepe-like texture and the presence on it of foci of keratosis and areas of senile pigmentation.

There is interest for the surgeon in an operation of this kind, not only in the removal of such a rapidly expanding growth, particularly on the auricle, but also in the emotional satisfaction it gives the patient to be freed from it.

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HEARING REHABILITATION IN PRIVATE PRACTICE

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OTOLOGY as a subspecialty in otolaryngology may be approaching the crossroads. Is the specialty of otolaryngology to surrender by default the responsibility for medical rehabilitation of the hard of hearing patient to organizations controlled and dominated by lay groups to the extent that such rehabilitation will not be within the realm of private medical practice? In several areas all types of promotion (press, radio, and television) are now being used to educate the public to seek aid for hearing handicaps from such facilities as nonmedical hard of hearing leagues, hearing societies, and hearing centers controlled by lay groups guided by nonprofessional philosophies. Also, many people are being advised to take advantage of the hearing diagnostic and rehabilitative services of university speech clinics, which are again out of medical control and, in the main, even lacking in close medical support or counsel. While we would have no quarrel with such organizations based on a program of teaching or research, we should be stimulated by current activities of all such groups to realize our responsibility in meeting the needs of the deafened population within our otolaryngologic practice and to give such needed service in our offices. Despite all efforts to educate the public to come to lay centers for aid, our experience has been that the enlightened public still looks to the otologist for professional advice and treatment of his hearing handicap. Macfarlan [1] has the same belief in this regard. Should we further disillusion the public concerning our interest in this handicap by shifting the responsibility for this care to a nonmedical group? If we were to investigate this particular phase of the subject further, we might ask ourselves the question "How many university or lay centers are actively directed by physicians or practicing otologists?" Another aspect to be considered for the future concerns the aspiring young otologist's ability to compete with hearing centers established and operated by public funds. Some such centers seek and accept private patients for diagnosis as well as for rehabilitation services. Some otolaryngologists support their claim as otologists by referring private patients to these centers for many phases of diagnosis of hearing problems, such practice being described by Wishart [2] as "a new bit of evasion by the otologist, which occurs in the fashionable new audiologic clinics." Such procedures are obviously dangerous to otology in the future. Lederer and Marcus * and Hoople [5] thoroughly discuss the need for otolaryngologists to accept their responsibility in such rehabilitation services and point to the importance of the otologist's role in active supervision of rehabilitation processes. Lewis [6] emphasizes this point, and Jordan [7] describes the otologist-audiologist

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* References 3 and 4.

teamwork as it occurs in the ideal university clinic, in order that the full potential of all hearing rehabilitation processes may be realized. In such an organization the optimum measures can be applied to the individual handicap. Other such organized university clinics exist, but such clinics are all too few.

Fenestration surgery † has afforded a great impetus to hearing rehabilitation for the otologist, and now we must go another step forward and add nonsurgical techniques to our armamentarium in private practice. Otherwise, none can deny that we are interested mainly in surgical techniques, as demonstrated by our emphasis on fenestration results in our medical reports, instead of a true interest in hearing rehabilitation as a whole. Why should the nerve-deafened patient, who obviously has more of a problem than his conduction-deafened friend, be shunted out of the picture because he does not fit into our narrow philosophy of surgical hearing rehabilitation? The hard of hearing patient is still bringing his problem to us as professional practitioners; why are we not equipped to give him the answer he seeks, if an answer to his problem is possible? The future growth and maintenance of vigor of any specialty must be based on service of an unexcelled degree to the public. Morrissett [10] has accentuated the problem of the nerve-deaf patient, but most authors have relegated the problem to the lay groups without thought of an adequate trial on a private practice basis. If expense of the operation is a major consideration, as Morrissett emphasizes, one might compare our specialty with a specialty such as roentgenology in considering expense of installation of equipment. In my experience the cost of adequate audiological equipment has not approached the cost of the purchase and installation of a comparable x-ray laboratory. Furthermore, one of the greatest errors in considering the problem has been to believe, without investigation, that the most elaborate equipment is necessary for private audiological work. While we should not minimize the great advances of the pioneers in the development of electronic equipment and associated hearing tests,‡ we should guard against being escorted away from the situation of the clinical diagnosis of deafness into the philosophy that an adequate diagnosis of deafness requires an exalted maze of shining equipment. In contrast, Mueller has demonstrated and House § has corroborated the fact that the old-fashioned speaking tube is a useful instrument in evaluating a hard of hearing patient's ability to wear a hearing aid. Somewhere between these extremes one can find adequate equipment for the every-day evaluation of this problem. Reger [13] states, "It is preferable to use simple equipment with clinically useful accuracy than to attempt to employ complex procedures with accompanying uncertainty about the results," and further quotes Lempert's [14] statement that "the otologist has less need for new functional hearing tests than for a better understanding of the tests he already has." To quote Reger further, he states: "The training and scientific integrity of the individual who uses the equipment is of much greater significance than the physical equipment itself." In judging the quality of audiological equipment for private clinical work, we must also realize that the margin of human error will be greater than the equipment error when comparing the use of adequate clinical equipment with the use of research equipment.

† References 8 and 9.

‡ References 11 and 12.

§ House: Personal communication to the author.

It is believed that our philosophy as otologists should entail an unequivocal approach to the problem of deafness with equipment, personnel, and knowledge to handle the various phases of hearing rehabilitation, surgical correction, hearing-aid evaluations, auditory training, speech diagnosis, and associated problems on a private basis in the otologist's office. I will endeavor to illustrate that nonsurgical rehabilitation methods are economical and efficient for all concerned and also stimulating to those interested in such practice.

FACILITIES AND PERSONNEL REQUIRED FOR CONDUCTING HEARING TESTS

Sound-Treated Rooms.—Two adequately sound-treated rooms, with an intervening window, which will insure fairly constant noise levels for testing, are required. For speech-perception testing and hearing-aid evaluation, the sound treatment must be adequate to prevent "feed back" at high intensities between the speaker and microphone. The doors are the weakest portion of the usual system, even though sound-treated double doors are used. For this reason the doors should empty into an adjacent hallway instead of from one sound-treated room to the other. Bergman [15] has illustrated several practical plans for construction of sound-treated rooms, but

TABLE 1.—*Cost of Audiological Equipment*

Equipment	Price Range
Clinical audiometer (Type: A.D.C. Microtone P-60 or Maico E-2)	$ 600-$1,000
High-fidelity amplifier	$ 100-$ 150
Turntable (if not built in audiometer)	$ 90-$ 150
Free-field speaker with cabinet	$ 100-$ 150
Monitor system	$ 50-$ 75
Master hearing aid	$ 400
Estimated total cost	$ 940-$1,925

the construction described is more expensive to install than is necessary for office practice. However, floating an inner room on cork or rubber and separating it from the outer room wall by an air space are necessary.

Audiological Equipment.—The six necessary items of equipment are the following:

1. A standard audiometer, such as the Maico E-2 or the Microtone P-60, with turntable and supplementary amplifier, which affords intensities of 100 to 110 db., is necessary. Most of my work has been done with the Microtone P-60 audiometer supplemented by a specially built bridging amplifier, and this combination has been quite satisfactory.

2. A speaker of good fidelity for free-field, pure-tone, and speech testing.

3. An auxiliary microphone in the testing room for intercommunication between rooms.

4. A master hearing aid, which is a unit capable of duplicating the chief characteristics of the standard hearing aids and their adjustments, including compression, with various types of ear receivers. This unit, with a set of standard ear pieces, may replace the usual hearing-aid library often used in clinic practice.

5. Records with spondee words for speech reception threshold testing (C. I. D. W-1 or W-2), phonetically balanced word lists records W-22, or printed lists of

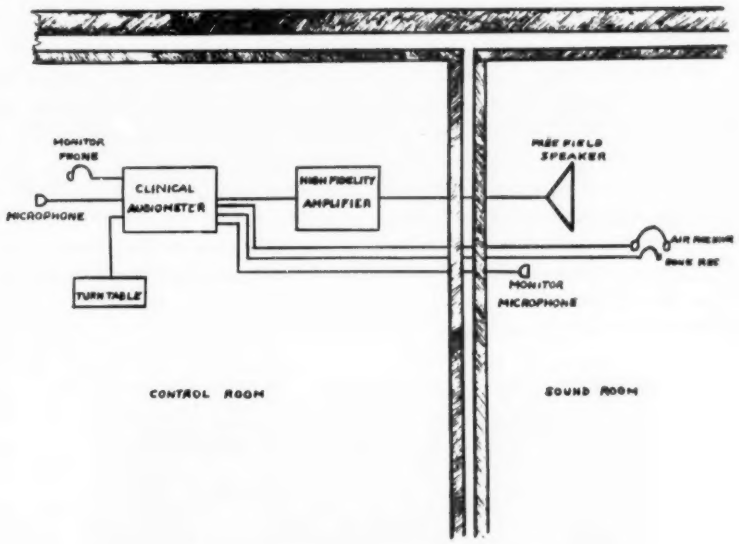

Fig. 1.—Diagram of equipment in rooms.

Fig. 2.—Microtone P-60 audiometer in cabinet containing bridging amplifier.

spondee or PB words for live-voice testing, tuning forks, noise makers, sound effects, pictures, charts, and various objects and toys to be used as aids in testing with children.

6. The Pediacoumeter [16] is an instrument which can be used with any standard audiometer to facilitate tests in the age group 2 to 6 years. This is a practical, easily administered tool for the difficult task of motivating the very young child in this type of testing.

Personnel.—The personnel should include an audiologist with a Master's or Ph.D. degree, depending on his availability and the scope of work desired. A proper person with a Master's degree in audiology and/or speech is capable of carrying on this program with an otologist in a highly efficient manner. The audiologist can also supervise nursing personnel in performing routine hearing testing and therefore be available for rehabilitation work. The audiologist I work with conducts an active

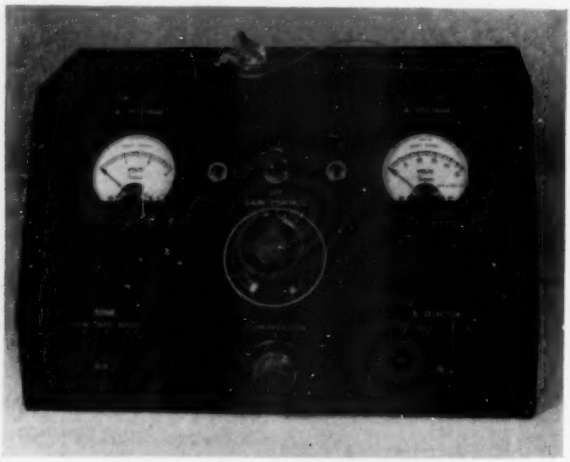

Fig. 3.—Master hearing aid.

speech and hearing rehabilitation practice in addition to the audiological work performed. The audiological and speech section of the organization shows a financial return which makes the section more than merely self-supporting. This factor, in addition to the services afforded in assuring highly competent preoperative and postoperative hearing tests as well as the many apparent advantages, makes the arrangement highly satisfactory.

The average pay for an audiologist with a Master's degree in a university position is $3,800 to $4,000 per year, and with a Ph.D degree it is $5,000 to $7,000, depending on his experience, on a nine months' basis. An audiologist in the private practice arrangement described has a much better future financially; and as a member of the otologist-audiologist team, in a clinical atmosphere, he will find satisfying scientific stimulation and achievement. When these factors are properly presented to aspiring audiologists, it is believed that the advantages will be readily recognized and that the horizons of audiological training and practice will be expanded. The advantages of such clinical experience should be readily apparent.

HEARING TESTS COMMONLY USED IN PRIVATE REHABILITATION PRACTICE

The following types of hearing tests are generally used in private practice rehabilitation:

A. Basic tests
  I. Pure-tone audiometry (with appropriate masking where necessary)
    a. Air
    b. Bone
  II. Tuning-fork functional tests

B. Advanced tests
  I. Pure tone
    a. Most comfortable loudness contour
    b. Threshold of discomfort contour
    c. Recruitment (reduced acuity at low intensity levels but more normal hearing at higher intensity levels)
      (1) Monaural equal loudness
      (2) Binaural balance
    d. Diplacusis
  II. Speech perception ‖
    a. Speech reception threshold (SRT), the lowest intensity at which a person can correctly identify 50% of spondee words presented
    b. Most comfortable loudness level (MCL) with connected discourse
    c. Uncomfortable loudness level (ULL or T.D.) with connected discourse
    d. Discrimination ability (PBM), the maximum percentage of phonetically balanced words repeated correctly at the most comfortable level (usually 25 db. above the SRT). The reciprocal of this then becomes the discrimination loss (DL).
    e. Social adequacy index (SAI), a figure based on hearing acuity loss for speech and discrimination loss, computed from tables and representative of the over-all social hearing adequacy for faint, usual, and loud sounds. The threshold at which a person can get by moderately well in direct conversation is 33.
  III. Tests for malingering or psychogenic hearing loss
    a. Lombard, to note change in patient's reading volume with increase of masking noise to his ears
    b. Stenger (pure tone or modified with speech), to note the intensity level of sound to a "deaf" ear at which the patient can detect the entrance or withdrawal of a tone to the good ear
    c. Doerfler-Stewart, to note the intensity level of noise to a "deaf" ear at which interference with speech reception takes place
  IV. Hearing-aid evaluation (tests presented through the speaker in the free field)
    a. Without the hearing aid
      (1) Hearing loss for speech (comparable to the SRT with ear phones)
      (2) Discrimination ability
        (*a*) In quiet
        (*b*) With noise
      (3) Tolerance level
    b. With the hearing aid (or any subsequent change in setting of instruments)
      (1) Hearing loss for speech
        (*a*) At comfort level, setting on the hearing aid amplifier
        (*b*) At full gain, setting on the hearing aid amplifier
      (2) Discrimination ability
        (*a*) In quiet
        (*b*) With noise
      (3) Tolerance level

‖ References 17 and 18.

V. Hearing evaluation in children

a. Pediacoumeter
b. Noise maker, attention arresting or searching responses
c. Sound effects, identification
d. Simple speech reception threshold, using similar objects. The lowest intensity at which the child can successfullly carry out three commands.

NONSURGICAL REHABILITATION

A practical example of nonsurgical rehabilitation in private practice, in which 90 consecutive hearing-aid evaluations were made, is illustrated in Tables 2 and 3.

TABLE 2.—*Hearing-Aid Evaluations in 90 Consecutive Cases*

Case, No.	Aid Purchased but not Worn	Nerve Deafness	Mixed Deafness	Unable to Wear Aid	Able to Wear Aid	Aid Worn with Difficulty	Aid Fitted Wrong Ear	Comments
1	..	X	..	48-38% *	....	....	..	No gain in sensitivity; loss in discrimination
2	..	X	..	....	....	66%	..	.....
3	..	X	..	....	....	58%	..	.....
4	..	X	..	36%	....	....	..	.....
5	..	X	..	32%	....	....	..	.....
6	..	X	..	36%	....	....	..	.....
7	..	X	..	30%	....	....	..	....
8	..	X	..	....	92%	....	..	.....
9	..	X	..	....	....	48%	..	.....
10	..	..	X	....	84%	....	..	....
11	..	..	X	....	84%	....	..	.....
12	..	X	..	....	....	X	..	Child
13	..	X	..	....	....	58%	..	.....
14	..	..	X	....	94%	....	..	.....
15	..	X	..	....	64%	....	..	.....
16	..	X	..	30%	....	....	..	.....
17	..	X	..	40%	....	....	..	.....
18	..	..	X	....	88%	....	..	....
19	..	X	..	....	98%	....	..	.....
20	..	X	..	....	78%	....	..	.....
21	..	..	X	....	100%	....	..	.....
22	..	X	..	....	84%	....	..	.....
23	..	X	..	36%	....	....	..	.....
24	..	..	X	....	68%	....	..	.....
25	..	X	..	30%	....	....	..	.....
26	X	..	X	....	62%	....	..	.....
27	..	..	X	....	98%	....	..	.....
28	..	X	..	....	X	....	..	Child
29	X	X	..	....	80%	....	X	.....
30	..	..	X	....	88%	....	..	.....
31	..	..	X	....	84%	....	..	.....
32	..	X	..	30%	....	....	..	.....
33	..	X	..	....	92%	....	..	.....
34	..	X	..	....	....	48%	..	.....
35	..	X	..	....	....	68%	..	Tolerance problem
36	X	X	..	42%	....	....	..	.....
37	..	..	X	....	92%	....	..	.....
38	X	X	..	....	....	48%	X	.....
39	..	X	..	....	76%	....	..	.....
40	..	..	X	....	88%	....	..	.....
41	..	..	X	82%	....	....	..	Not recommended; too little gain in sensitivity
42	..	X	..	....	86%	....	..	.....
43	X	X	..	....	82%	....	X	.....
44	..	X	..	92%	....	....	..	Psychologically unprepared for small gains possible
45	..	X	..	22%	....	....	..	.....
46	X	..	X	....	92%	....	X	.....
47	..	X	..	....	X	....	..	Child

TABLE 2.—*Hearing-Aid Evaluations in 90 Consecutive Cases*—Continued

Case, No.	Aid Purchased but not Worn	Nerve Deafness	Mixed Deafness	Unable to Wear Aid	Able to Wear Aid	Aid Worn with Difficulty	Aid Fitted Wrong Ear	Comments
48	X	..	X	....	....	52%	..	.....
49	..	X	..	....	....	60%	..	.....
50	..	X	..	....	78%	....	..	.....
51	..	X	..	....	76%	....	..	.....
52	..	..	..	....	84%	....	..	Conduction loss; patient aged 9 years
53	..	X	..	....	....	60%	..	.....
54	..	X	..	....	....	58%	..	.....
55	..	X	..	....	88%	....	..	.....
56	..	..	X	....	90%	....	..	.....
57	..	..	X	....	96%	....	..	.....
58	..	X	..	64-56% *	....	....	..	Loss in discrimination without adequate gain in sensitivity
59	..	..	X	....	96%	....	..	.....
60	..	..	X	....	94%	....	..	.....
61	..	X	..	18%	....	....	..	.....
62	..	..	X	....	92%	....	..	.....
63	..	X	..	20%	....	....	..	.....
64	X	X	..	....	70%	....	..	.....
65	..	X	..	....	82%	....	..	.....
66	..	..	X	....	92%	....	..	.....
67	X	X	..	....	82%	....	..	.....
68	..	X	..	....	80%	....	..	.....
69	..	X	..	....	88%	....	..	.....
70	X	X	..	....	80%	....	X	.....
71	..	X	..	....	90%	....	..	.....
72	..	X	..	....	....	50%	..	.....
73	X	X	..	0%	....	....	..	.....
74	..	..	X	....	98%	....	..	.....
75	..	X	..	....	....	42%	..	Gain of 40 db. in sensitivity; same discrimination
76	..	X	..	78-58% *	....	....	..	Loss in discrimination
77	..	X	..	....	X	....	..	Gain of 40 db. in child
78	..	..	..	....	76%	....	..	Conduction loss
79	..	X	..	84%	....	....	..	No gain in discrimination or sensitivity
80	..	X	..	24%	....	....	..	.....
81	..	X	..	0%	....	....	..	.....
82	..	..	X	....	90%	....	..	.....
83	..	..	X	....	88%	....	..	.....
84	..	X	..	64%	....	....	..	Marked tolerance problem
85	..	..	X	....	....	52%	..	.....
86	..	X	..	....	....	48%	..	.....
87	..	X	..	....	82%	....	..	.....
88	..	X	..	....	68%	....	..	.....
89	..	X	..	....	64%	....	..	.....
90	..	X	..	30%	....	....	..	.....
	Total 11	Total 63	Total 25	Average 40%	Average 85%	Average 54%	Total 5	

* Loss of indiscrimination ability with amplification.

TABLE 3.—*Distribution of the Discrimination Ability (PBM) Scores in Ninety Patients According to Type of Hearing Loss*

Type of Hearing Loss	Average PBM Score, %	Patients, No.
Nerve		
Patient able to wear aid	81	26
Patient wears aid with difficulty	55	14
Patient unable to wear aid	43	23
Total	..	63
Mixed		
Patient able to wear aid	89	22
Patient wears aid with difficulty	52	2
Patient unable to wear aid	82	1
Total	..	25
Conduction		
Patient able to wear aid	80	2

COMMENT ON HEARING-AID EVALUATION STATISTICS

. The discrimination scores were obtained by use of live voice. All of the patients had hearing handicaps which averaged more than 30 db. for the speech frequencies for pure tones. The gains in sensitivity had to be 10 db. or greater before an appreciable gain was recognized. Some of the patients gained in sensitivity but did not gain in discrimination, while other patients showed an appreciable loss for discrimination without adequate gain in sensitivity.

Before the statistics are reviewed, it is well to consider [19] the fact that speech testing affords a practical method, in part, for determining a person's ability to wear a hearing aid. One factor in the test has to do with sensitivity, or need for amplification, and another concerns the ability to discriminate the sounds when heard at relatively high intensities. The test for sensitivity is the speech reception threshold (SRT), described in the section on hearing tests. The other factor in speech testing has to do with the person's ability to discriminate the sounds of speech when heard at relatively high intensities. This test of the patient's discrimination ability is known as the PBM test, also described above. Moreover, in addition to discrimination scores and gain in sensitivity, such factors as tolerance for amplification and psychological acceptance must be considered in determining a person's ability to wear an aid. In considering discrimination scores obtained by the use of live voice as one indication of a person's ability to wear an aid, Carhart ¶ has devised the following guide, which is intended to be a rule of thumb only:

Discrimination Scores	Results with Aid
90% and above	Good
70 to 90%	Effective use of aid
50 to 70%	Substantial difficulty
30 to 50%	Great difficulty
Below 30%	Extreme difficulty

It will be seen that my results of hearing-aid evaluations follow this rule substantially in regard to discrimination scores.

The breakdown of the statistics shows that 63 patients had pure nerve deafness, 25 patients had mixed deafness, and 2 patients had conduction deafness.

Pure Nerve Deafness.—Of this group of 63 patients, 23 were unable to wear an aid. Seventeen patients were unable to wear an aid because of poor discrimination scores, which ranged from 0 to 42%. One patient with a discrimination score of 64% was unable to wear an aid because of poor tolerance for amplification. One patient with a discrimination score of 84% received no appreciable gain in sensitivity or discrimination and therefore was not suited for an aid. Three patients with discrimination scores of 78, 64, and 48% lost discrimination to an appreciable degree with amplification and therefore were not considered candidates for an aid. One patient with a discrimination score of 94% was psychologically unprepared to accept an aid because of the distortion and the small gain in sensitivity obtained.

Mixed Deafness.—All 25 patients in this group showed a definite air-bone gap, with a drop-off for high tones in both air-conduction and bone-conduction curves on pure-tone audiometry.

Twenty-two patients in this group were able to wear an aid, with scores ranging from 68 to 98%. Two patients were able to wear an aid with difficulty, having discrimination scores of 52%. One patient with a score of 82% did not obtain appreciable gain in sensitivity and therefore was unsuited for the aid.

¶ Carhart: Personal communication to the author.

Conduction Deafness (Two Patients).—The two patients in this group were children of 9 and 11 years respectively, and they were able to wear aids, having scores of 84 and 76%.

Aids Fitted in the Wrong Ear.—Of the group of patients (66) who were capable of wearing hearing aids, five patients had been previously fitted in the wrong ear. All these patients were nerve-deafness patients who had been fitted with aids in the worse ear, based on pure-tone curves.

Patients Who Had Previously Purchased Aids.—Nine patients had purchased aids previous to the examination and were not wearing them. Five of these patients had been fitted in the wrong ear. Two patients who had previously purchased aids but were not able to wear the instrument satisfactorily were able to wear an aid of another specification.

SUMMARY AND CONCLUSIONS

It is believed that the foregoing material illustrates that the described rehabilitation methods are practical and that hearing rehabilitation is an integral part of otolaryngology in private practice. In addition to the medical rehabilitation procedures discussed, surgical methods, such as the fenestration operation and correction of congenital atresia of the external auditory canal, and office procedures, such as closure of tympanic membranes and treatment of chronic secretory otitis, are important rehabilitation measures inherent in the program. The otologist-audiologist team is able to diagnose the hearing handicap on the basis of the pathology present and advise the patient as to the most suitable therapy as well as administer the appropriate therapy. In this manner the otologist fulfills his responsibility as a physician to the hearing handicapped. The services described can readily be available in medical centers on a private basis, with the audiologist working in conjunction with one otologist in a busy practice or, if need be, in a rehabilitation laboratory sponsored and directed by several cooperating otologists in a medical building. This approach permits the otologist and audiologist to actively participate as a team in this most interesting practice of hearing rehabilitation.

509 Hermann Professional Building.

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Case Reports

EOSINOPHILIC GRANULOMA OF THE FRONTAL BONE

Report of a Case

BENJAMIN H. SHUSTER, M.D.
AND
THOMAS F. FLYNN Jr., M.D.
PHILADELPHIA

EOSINOPHILIC granuloma is primarily a disease of the reticuloendothelial system and is related to Hand-Schüller-Christian disease and Letterer-Siwe disease. In fact, Jaffe, who reported one of the first cases bearing this name, believes that these conditions are clinical gradations of the same basic disorder. It is thought at present that eosinophilic granuloma is infectious in nature, although no specific organism has been discovered.

This granuloma usually occurs in children and affects any of the bones, especially those of the skull, ribs, and ilium.

The onset is insidious, and usually the pathology is discovered accidentally by x-ray (by physical signs of enlargement over the bone affected or precipitation by trauma). Clinically the disease is manifested by a nontender enlargement or swelling over the area involved. Since it is osteolytic, x-rays show areas of well-circumscribed radiolucencies. Microscopically, clumps of eosinophiles are predominant. A large amount of plasma cells, reticular network, leucocytes, lymphocytes, multinucleated giant cells, and products of destruction and repair are present.

The treatment consists of either curettage or x-ray. The prognosis is guarded. These lesions may recur locally or progress into a more malignant phase.

REPORT OF A CASE

A white girl, aged 3 years, with a history of trauma to the right forehead was admitted to the hospital. The child was struck with a wooden stick on June 20, 1953, sustaining two small abrasions with minimal bleeding. Several hours after the injury her mother noticed some fullness in the child's right eyelid, which after a period of two days extended above the right eyebrow. The area was inflamed and tender to palpation but not exceptionally painful to the patient.

No interference with vision was noticed at this time, nor were any systemic symptoms present. One week after the injury, the swelling had increased considerably and the eye was closed. She was then seen by her local physician, who prescribed boric acid soaks and penicillin by injection, to no avail. On July 18, approximately one month later, the patient was taken to a clinic, and after three days of unresponsive treatment as an outpatient, she was admitted to the hospital. The roentgenologist reported an area of demineralization of the frontal bone, possibly osteomyelitis. The patient was then prepared for surgery, and the area was incised. The surgeon encountered tissue which was thought to be neoplastic, and a biopsy specimen was taken. The pathologic diagnosis was eosinophilic granuloma of bone.

With this information, the patient was referred to the graduate hospital for further study. On admission to the hospital, the patient was examined physically, and no abnormalities were found except the previously described area. This supraorbital mass was firm, but the central area around the incision was fluctuous. The ophthalmoscopic examination was negative. The pupils reacted to light and accommodation; no paralyses were present, but there was a minimal amount of conjunctival injection.

Read before the Section on Otolaryngology of the Philadelphia College of Physicians, Nov. 18, 1953.

The x-rays demonstrated a somewhat irregular bony destructive process measuring 3.5 by 3.5 cm., involving the right frontal bone in its anterior aspect as well as the superior and lateral rims of the bony orbit (Fig. 1). It was thought at this time that this represented a first-degree tumor or granuloma. The long-bone survey was negative for pathology.

The laboratory work was essentially negative. No eosinophilia could be demonstrated even after repeated blood cell counts. The neurologist examined the patient and could find no evidence

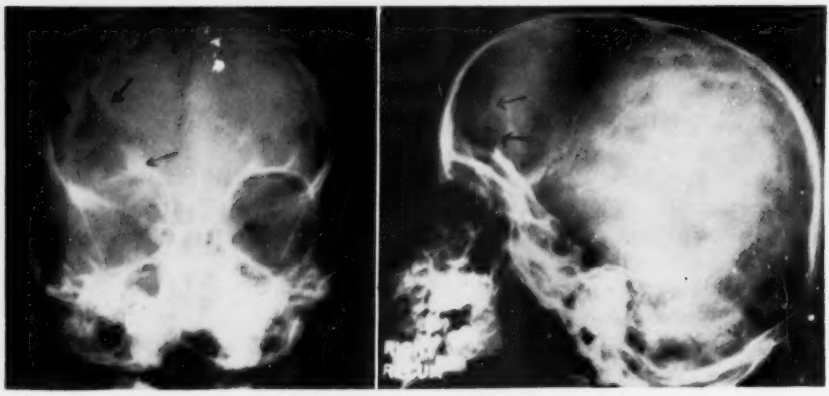

Fig. 1.—Preoperative x-rays showing area of radiolucency.

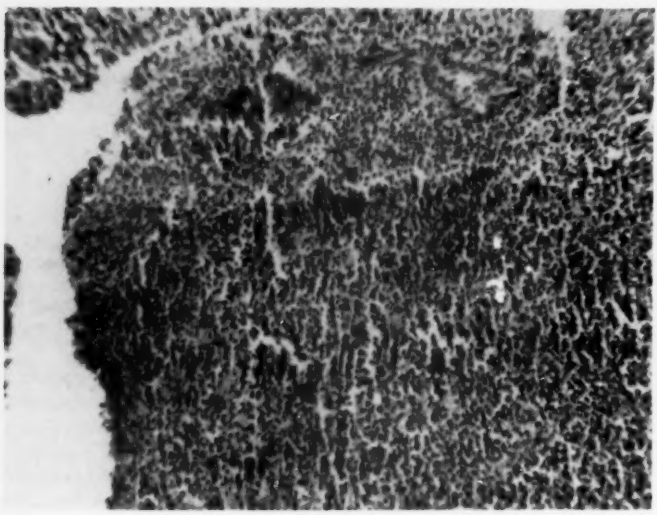

Fig. 2.—Low-power section showing clumps of eosinophiles.

of intracranial disturbances. The patient was seen by the otolaryngology department, and it was felt that there was infection present, superimposed on the granulomatous process, and that this should be excised surgically.

Under general anesthesia, an incision, 3 cm. in length, was made over the lateral aspect of the right nasal bone because this appeared to be the route of facility for exposure, if, perhaps, this lesion was invading or emanating from the ethmoid sinus. The dissection was carried into the orbit along the medial wall, and the ethmoid plate was exposed and found to be uninvolved.

Since there was no involvement in this region and the tumor seemed to be confined to the lateral aspect of the orbit, the previous incisional site was enlarged, and a large mass of yellowish-brown necrotic tissue was removed. This appeared to be encapsulated and contained a minimal

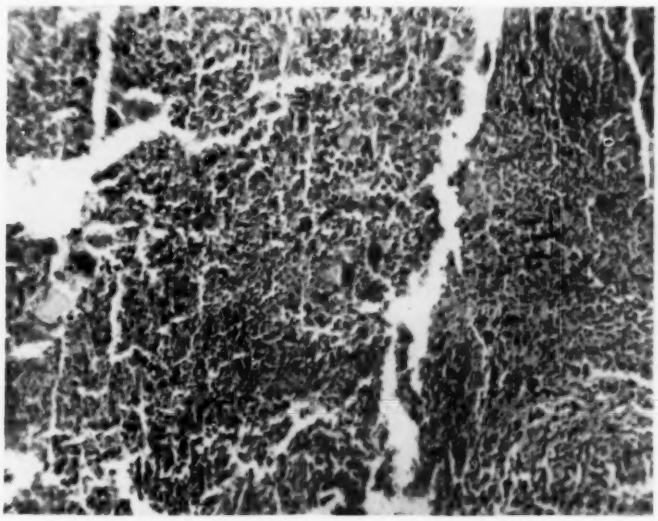

Fig. 3.—Low-power section showing giant cells throughout the area.

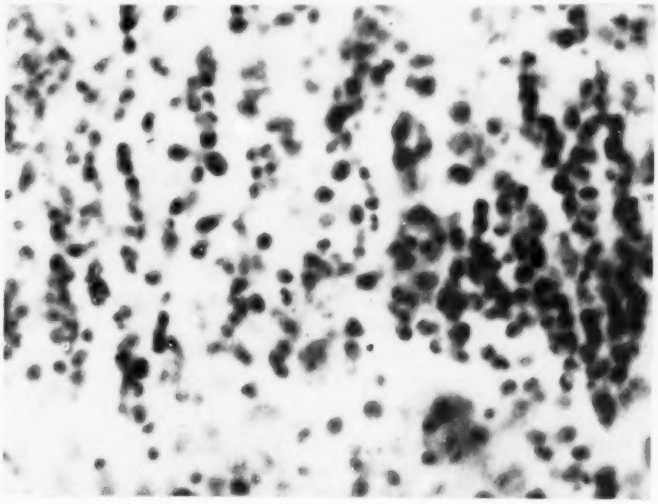

Fig. 4.—High-power section demonstrating clumps of eosinophiles (at right).

amount of purulent material. After the friable tissue was removed, it was noted that the supra-orbital rim was eroded from the supraorbital notch to the frontomalar suture line. An area of dura, measuring 2 cm. in diameter, was exposed in the roof of the orbit and was covered with granulation tissue. These granulations were carefully removed, and the periorbita deep to this

erosion was elevated from the superior wall of the orbit down to the supraorbital fissure and found to be free from disease. After all the tissue was exenterated, two polyethylene tubes were placed within the cavity, and iodoform gauze was used as a light packing. The incisions were closed with 5-0 skin and tension (Dermalon) sutures, and the patient left the operating room in good condition.

The microscopic section of this tissue showed the typical structure of an eosinophilic granuloma. Figure 2 is a low-power view and shows clumps of eosinophiles on a background of reticular network. Small areas of erythrocytic extravasation, along with a large amount of lymphocytes, can be seen. Figure 3 shows the multinucleated giant cells—the darker staining cells with the more nuclei. Under high power the eosinophiles are demonstrated much better, and here also can be seen the predominance of plasma cells and lymphocytes (Fig. 4).

The postoperative course was uneventful. The polyethylene tubes were removed in five days, and all the packing was removed by the seventh day. The patient was discharged approximately two weeks after surgery.

The patient has been followed in the outpatient clinic, and there has been neither evidence of recurrence nor presence of systemic signs or symptoms.

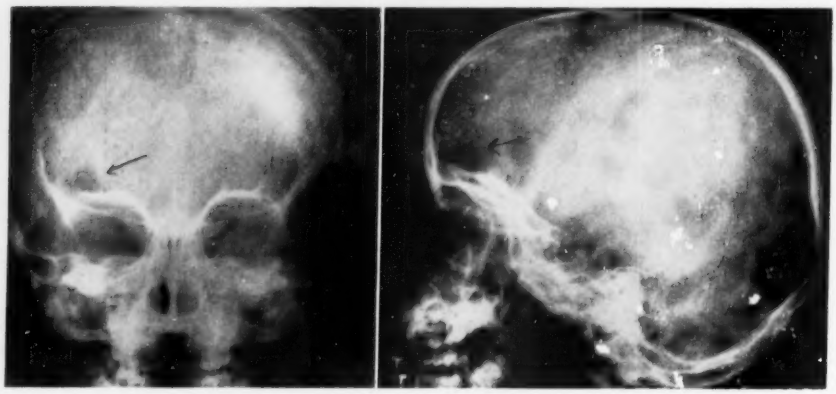

Fig. 5.—X-rays taken three months postoperatively showing marked regeneration.

X-rays were taken three months after surgery. Figure 5 shows marked bony regeneration of the supraorbital rim, and the radiolucent area previously seen is almost absent. The lateral view also shows this regeneration of bone.

This case is reported mainly for two reasons. First, interesting pathology was present, and the results were obtained with surgical excision rather than with radiation. Surgical incision, we feel, is better in view of the fact that drainage can be adequately established. Secondly, these lesions are commonly referred to the otolaryngologist in view of the swelling in the orbital region and are frequently assumed to be of sinus origin. When no sinus pathology can be found, it is obvious that the otolaryngologist must be prepared to execute such procedures required, even though they involve the exploration of the orbit or cranial cavity.

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RHINOSCLEROMA SUCCESSFULLY TREATED WITH OXYTETRACYCLINE (TERRAMYCIN)

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RHINOSCLEROMA is relatively rare in this country but is being reported with increasing frequency in recent years. Of approximately 120 cases reported in the United States and Canada, about 25 have occurred in native-born persons, the rest in foreign-born.[1] The disease almost always begins in the nose with a dry mucous membrane and crusting. This stage may last for years but gradually passes into a second stage of fungating granulomas. The disease may spread to the pharynx and larynx. In the third stage the granulomas become hard and sclerotic and then leave scars and stenoses.

The diagnosis can be established by biopsy and by culture of the von Frisch bacillus, Klebsiella rhinoscleromatis. There has been much discussion in the past as to whether the von Frisch bacillus was the true etiologic agent, and the evidence accumulated to date indicates that it is the cause of the disease.[2]

Much has been reported about the efficacy of streptomycin in the treatment of rhinoscleroma.[3] At present streptomycin seems to be considered the drug of choice, but streptomycin has to be administered parenterally. When a case was discovered in our clinic recently and the diagnosis was confirmed by biopsy and culture, we decided to try oxytetracycline (Terramycin) because it could be administered orally; and we were highly pleased with the result.

REPORT OF CASE

A 66-year-old Latin-American woman entered the Robert B. Green Memorial Hospital clinic in February, 1953, with a chief complaint of nasal obstruction and sore throat, of long duration. She was born in Mexico but had resided in San Antonio since 1928. Symptoms dated back six years, when a "sore" started in her nose.

Examination revealed a large granulomatous mass extending from the anterior end of the inferior turbinate, filling the left nostril completely, and bulging the ala nasi. The right nostril was stenosed to about one-eighth its normal diameter. The soft palate showed a stellate scar, with dimpling, absence of the uvula, and bulging in one area. A smaller granulomatous mass was found on the right lateral pharyngeal wall, behind the posterior pillar. Beneath this there was some lateral pharyngeal wall lymphadenopathy. There was no cervical lymph node enlargement. X-rays of the sinuses were normal. Physical examination was essentially negative, except for the nose and throat findings described.

Rhinoscleroma was suspected, and biopsy specimens of the nasal mass were taken in the clinic for microscopic study and for culture.

Microscopic sections disclosed the characteristic features of rhinoscleroma. The lesion was composed of a dense submucosal infiltration of inflammatory cells, consisting principally of Mikulicz cells, with a mixture of smaller numbers of plasma cells and lymphocytes. The Mikulicz

cells are pathognomonic of rhinoscleroma and are composed of macrophages, swollen with large numbers of encapsulated von Frisch bacilli, giving a foamy, vacuolated appearance to the cytoplasm in the routine hematoxylin and eosin stain. The intracellular organisms were demonstrated with Giemsa stains and Warthin-Starry silver impregnations. Russell bodies are often described as being characteristic of this lesion, and in these sections there were a few small hyaline eosinophilic bodies which could be interpreted as Russell bodies, but they were certainly not of any help in establishing the diagnosis.

The von Frisch bacillus, K. rhinoscleromatis, grew rapidly on routine culture media, and its identity was established by the biochemical characteristics elucidated by Levine.[2] Sensitivity studies demonstrated varying degrees of sensitivity of the organism to oxytetracycline, streptomycin chloramphenicol, and neomycin, and resistance to penicillin, sulfathiazole, sulfadiazine, polymixin, chlortetracycline (Aureomycin), bacitracin, erythromycin, and carbomycin.

After diagnosis the patient was started on treatment with oxytetracycline hydrochloride, one 250 mg. capsule four times a day. Within 12 days the sore throat was much better. After three weeks the oxytetracycline dosage was reduced to one capsule three times a day. At the end of five weeks the oxytetracycline was stopped. A second biopsy and culture were then made. The culture was negative. Mikulicz cells still showed in the biopsy tissue but were much reduced in number.

The stenotic right nostril was split open, and a hard-rubber tubular splint was worn in the nostril for four weeks, while the raw area epithelized.

Within three months the large mass in the left nostril, from which the biopsy specimens were taken, had shrunk to a small nubbin on the turbinate, and the nostril was open for breathing. The bulge and dimple in the soft palate disappeared, and the mass on the lateral pharyngeal wall became a stellate scar. The lateral pharyngeal wall lymphadenopathy took the longest of any of the swellings to disappear (seven months). The turbinate nubbin was gone in five months. Now, after 14 months, there is no sign of recurrence.

At the present time the patient is free of all symptoms. There is normal ventilation through both nostrils. Nothing remains of the disease except scar tissue—scars on the palate, pharynx, and nostrils. After many years of symptoms, the patient is very happy to have been cured of a disease that had disabled her for work.

COMMENT

K. rhinoscleroma is a member of the Friedländer group, which includes the organisms of Friedländer's pneumonia and granuloma inguinale. Until relatively recent years there has been considerable difficulty in establishing the identity of the various members of the Friedländer group. The work of Levine and his associates, summarized in 1951,[2] indicated that the rhinoscleroma bacillus can be accurately separated from the other Friedländer organisms by adequate biochemical studies. Serologic studies of Kauffmann,[4] reported in 1949, demonstrated the antigenic specificity of this organism. Of the strains studied biochemically by Levine, 11 were also studied serologically by Kauffmann, and the findings of these investigators were in agreement. This demonstration of the specificity of the organism, together with the alleviation of the disease with antibiotic therapy, has just about confirmed K. rhinoscleromatis as the etiologic agent.

There is a remarkable similarity between the histologic reaction produced by K. rhinoscleromatis and the Klebsiella organism of granuloma inguinale. Although the tissues involved are very different, the essential histologic features are almost identical, particularly in the similarity between the Mikulicz cells of rhinoscleroma and the Pund cells of granuloma inguinale and in the demonstration of the organisms by special stains. A recent case of granuloma inguinale at this hospital, to be reported by Strozier and others, also showed a dramatic therapeutic response with oxytetracycline.

SUMMARY

We believe this is the first case report outside of Russia of rhinoscleroma successfully treated with oxytetracycline (Terramycin). The case represents added evidence that the von Frisch bacillus (K. rhinoscleromatis) is the causative agent of this disease. It illustrates how relatively easily the disease can be cured by oral medication, without hospital admission, and how large sclerogranuloma masses disappear without surgery.

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Clinical Notes, New Instruments and Techniques

NEW CARTILAGE KNIFE FOR RHINOPLASTY

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Cosmetic rhinoplasty usually involves the lowering of the nasal dorsum to create either a straight or a concave profile. This procedure requires the proportionate lowering of both the osseous and the cartilaginous nasal dorsum. After the nose is skeletonized and transfixed, the osseous nasal "hump" is removed. The upper lateral cartilages are separated from the septum, and the lateral osteotomies are performed. These procedures are followed by lowering of the dorsum.

Fig. 1.—Rish cartilage knife.

Several methods for the lowering of the cartilaginous dorsum are available. Among these are the following.

(*a*) Scissors of various types, including small, large, straight, curved, and angulated, may be used. These can be used successfully only when the amount of septum to be trimmed is considerable (2 to 3 mm. or more). If, however, it is desired to trim less than 2 mm. (commonly done in making the final fine adjustments), the scissors will have a tendency to slip, producing an irregular dorsal edge, particularly if repeated attempts are made.

(*b*) The Joseph angulated (hockey-stick) knife is often employed for lowering the septum. It must be used under direct and unobstructed vision. It, however, can be a rather treacherous instrument, as the knife has a tendency to cut deep into the cartilage, causing disastrous results. Several years ago, an ingenious guard on the angulated knife was designed by Maltz. This, however, has not been found to be totally satisfactory, as the cartilage has a tendency to jam between the blade and the guard.

Chief, Otorhinolaryngology Section, Veterans Administration Hospital, Brooklyn.

(*c*) The long-handled scalpel, usually with a No. 11 Bard-Parker blade, can be used successfully to lower the cartilaginous dorsum. Because of the limited working area available, this method is fraught with difficulties. One may incise too deeply into the cartilages or injure the adjacent tissues, particularly the columellar rim.

These inherent difficulties encountered with the presently available methods prompted the design and construction of a simple instrument which would do the required work satisfactorily and would obviate the dangers and difficulties outlined above. The basic requirements for this new instrument were that it remove a uniform, controlled, thin amount of dorsal septal cartilage with absolute safety.

This knife removes the cartilaginous dorsum in steps of less than 0.5 mm. It has a small, sharp blade which is protected and is attached at an angle of 105 degrees to a long, thin handle. The instrument has no sharp or pointed edges to cause damage to adjacent structures. Regardless of the pressure exerted, it is virtually impossible to remove more than 0.5 mm. of cartilage

Fig. 2.—Regardless of the pressure exerted, the new cartilage knife will actually "shave" the cartilaginous dorsum in steps of less than 0.5 mm.

at a time (Fig. 2). As with the conventional methods, it may be necessary to steady the cartilage, particularly if thin, by means of thumb or fixation forceps. Unobstructed vision is not essential. This is a decided advantage, particularly in revision procedures in which there may be irregularity of the dorsal septum or residual convexity involving the cartilage. A small intercartilaginous incision can be made on one side, the tissues undermined, and the knife introduced. Subsequently, the septal cartilage is "shaved" to the desired level, as guided by palpation, and the fragments are removed.

This cartilage knife is not intended to supplant the instruments in use today. It is intended as an addition to the armamentarium of the rhinoplastic surgeon. It is particularly valuable in the important final cartilaginous adjustments. Moreover, it offers the surgeon doing rhinoplasty the advantages of an instrument which is simple to use, is relatively safe, and assures more satisfactory and exacting results.

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A SIMPLE DEVICE FOR BINAURAL TESTING

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The vast majority of audiometers in use today permit testing only one ear at a time. This type of instrument is quite adequate for threshold plotting, but it is not suited to perform the more advanced diagnostic tests and certain procedures used to detect various varieties of exaggeration and malingering. In order to perform these latter procedures, it is necessary that the instrument have the ability to deliver to each ear simultaneously a similar tone of variable intensity. Ideally this can be obtained by the use of two audiometers equally matched, or one can purchase the more advanced research type of instrument. This, of course, would involve purchasing a new, expensive instrument.

The advanced diagnostic tests and malingering procedures are qualitative rather than quantitative tests, and it is not vital that they be as accurate as a threshold audiogram. Therefore, the instrument illustrated below was devised. It is inexpensive and can be assembled by anyone with an elementary knowledge of electronics. Indeed, the first model, which is not shown, I put together with a few dollars worth of war surplus material. With this device attached to any audiometer in the manner shown, practically all the advanced hearing tests can be performed with the accuracy of a double audiometer or a research type of instrument. The following is a list of the materials required, with approximate costs as of Feb. 1, 1954.

Panel and case	$ 1.00
2 dials	.50
2 knobs	1.20
2 microswitches	.60
2 25-300 ohm rheostats	2.70
3 phone jacks	1.20
1 pair 10,000 ohm low impedance phones	3.00
2 phone plugs, wire, etc	1.00
Total	$11.00

Figures 1, 2, and 3 demonstrate the wiring diagram plus a simple suggested arrangement.

The device is very simple to operate, and, though it is not used for threshold plotting, it is surprisingly accurate. If a dual headset is available, then, of course, it is not necessary to purchase additional phones. In actual operation the device is attached to the audiometer as illustrated, and the frequency desired is fed into the circuit. The intensity of both tones may be controlled simultaneously by means of the attenuator of the audiometer, or each tone can be varied separately with use of the individual rheostats or attenuators on the new device. The micromatic switches may be of either the normally on or the normally off type; I prefer the normally off type, because it is less fatiguing to the patient.

USE OF THE INSTRUMENT IN HEARING TESTS

The following more commonly known advanced tests can be performed with this instrument. A brief description of the test will be given.

Binaural Loudness Balance Test.—For this very highly useful test this instrument can be used with accuracy and ease. The frequency with the greatest increment is selected, and the attenuator of the audiometer is set at maximum intensity. Then the threshold for each ear is recorded separately. The threshold of the better ear is lowered and an equal tone obtained for

the opposite ear. Because of continuous attenuation, this instrument has the advantage of being able to record the growth of recruitment, which is also a significant finding. The metric numerals on the calibrating dial can be standardized to read decibels if desired; however, this is not necessary.

This device is particularly useful in the detection of malingering and exaggeration. The following more commonly known tests are performed as described.

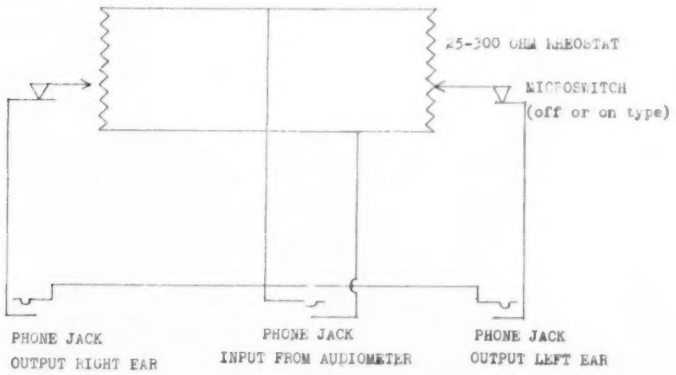

Fig. 1.—Wiring diagram for tone divider.

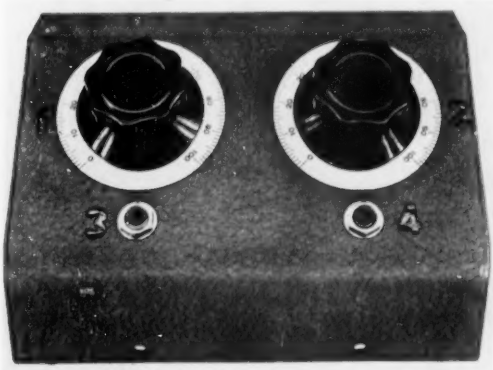

Fig. 2.—Front view of tone divider: 1, rheostat control for right ear; 2, rheostat control for left ear; 3, micromatic switch normally off or normally on for right ear; 4, micromatic switch normally off or normally on for left ear. Generally, the normally off switch is the preferable type

Lombard Test.—This test, which is used to detect bilateral hearing malingering or exaggeration, is performed by utilizing the masking tone of the audiometer delivered with equal intensity to each ear while the patient reads selected material. The raising of the reading voice when the intensity is raised 20 to 25 db. above threshold would indicate hearing ability.

Stenger Test.—The Stenger test for unilateral malingering is also easily performed. Without a device such as this it is cumbersome and time-consuming and not so accurate. The 512 or 500 frequency is used with the main attenuator set at maximum. The threshold for the admittedly

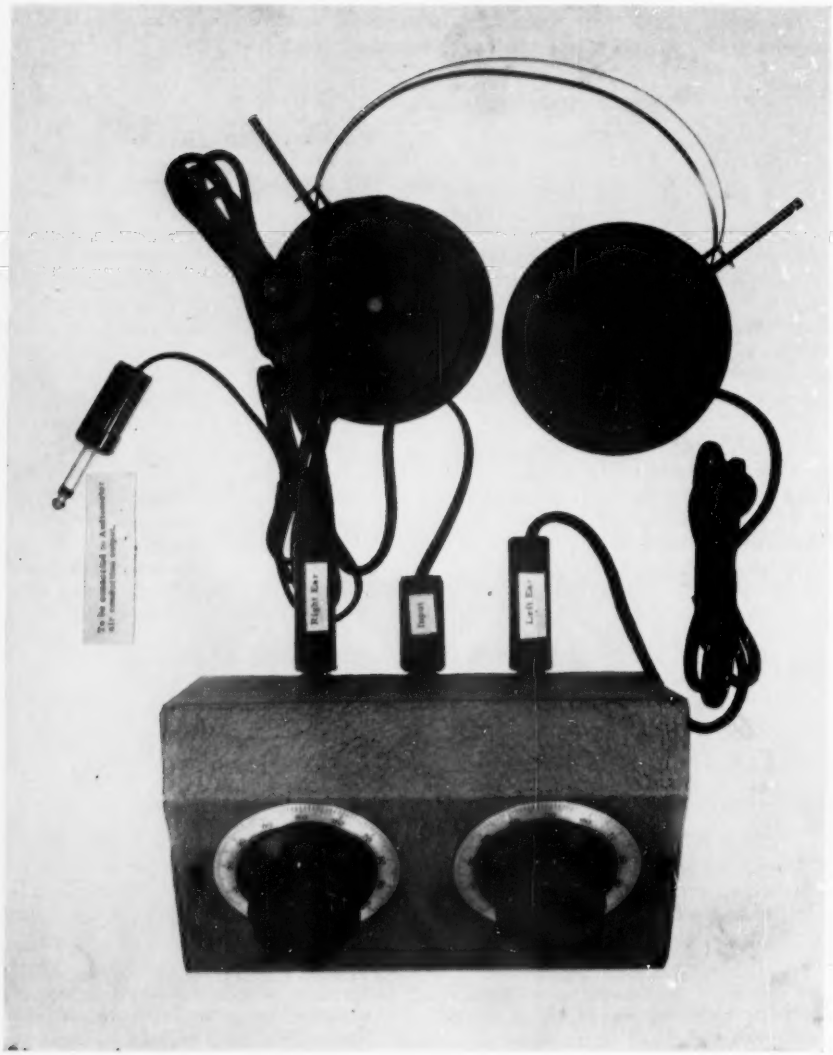

Fig. 3.—Top view of tone divider, showing cord attachment to air-conduction output of audiometer and right and left phones separately attached.

good ear is established. Then a similar tone of an intensity about 25% higher is delivered simultaneously to the alleged deafened ear. Because of the masking effect of the higher intensity, the tone will be perceived in the allegedly deaf ear; if malingering is present, the patient will indicate that he does not hear any tone. However, if there is actual deafness in the ear, then he will continue to hear the tone in his good ear. Any frequency where a disparity of perception is alleged can be tested provided that the increment is large enough. By varying the intensity of the good ear to below threshold one can detect exaggeration as well as actual simulation of complete hearing loss.

The Doerfler-Stewart and the modified Stenger test can also be performed with this device. In the latter test the speech reception threshold, rather than pure tones, is used. Similarly, by using the microphone through the circuit and varying the intensity delivered to each ear, one can perform the equivalent of the old stethoscope test with greater ease and accuracy.

CONCLUSION

With practice the range of usefulness of this device can be expanded and it should prove to be an inexpensive and valuable addition to our armamentarium.

35-02 168th St.

Special Reports

HEARING AIDS ACCEPTED BY THE COUNCIL ON PHYSICAL MEDICINE AND REHABILITATION OF THE AMERICAN MEDICAL ASSOCIATION

AS OF SEPT. 1, 1954

Acousticon Models A-17, A-180, & A-185
Mfr., Dictograph Products Inc.
95-25 149th St.
Jamaica 35, N. Y.

Audiotone Models 11 & 15
Mfr., Audio Company of America
5305 N. 6th St.
Phoenix, Ariz.

Audivox Models Super 67 & 70
Mfr., Audivox, Inc.
123 Worcester St.
Boston 18

Aurex Models L & M
Mfr., Aurex Corporation
1117 N. Franklin St.
Chicago 10

Beltone Mono-Pac Model "Lyric"

Beltone Mono-Pac Model M

Beltone Mono-Pac Model "Rhapsody"
Mfr., Beltone Hearing Aid Co.
2900 W. 36th St.
Chicago 32

Cleartone Model 700
Mfr., American Sound Products, Inc.
1303 S. Michigan Ave.
Chicago 5

Dahlberg Junior Model D-2

Dahlberg Model D-3 (Tru-Sonic)

Dahlberg Model D-4 (Tru-Sonic)
Mfr., The Dahlberg Company
Golden Valley
Minneapolis 22

Fortiphone Models 19LR, 20A, 21C, & 22
Mfr., Fortiphone Limited
Fortiphone House
247 Regent St.
London, W.1, England

Distr., Anton Heilman
75 Madison Ave.
New York 17

Gem Model V-60
Mfr., The Gem Ear Phone Co., Inc.
50 W. 29th St.
New York 1

Goldentone Models 25, 69, & 97
Mfr., Johnston Hearing Aid Mfg. Co.
708 W. 40th St.
Minneapolis 8

Distr., Goldentone Corp.
708 W. 40th St.
Minneapolis 8

Maico Maxitone

Maico Model J

Maico Top Secret Model L
Mfr., The Maico Company, Inc.
21 N. 3rd St.
Minneapolis 1

Micronic Model Mercury
Mfr., Audivox, Inc—Successor to Western
Electric Hearing Aid Division
123 Worcester St.
Boston 18

Microtone Models T-10 & T-612
Mfr., The Microtone Corporation
758 S. Mississippi River Blvd.
St. Paul 1

Normatone Model C

Normatone Model D-53
Mfr., Johnston Hearing Aid Mfg. Co.
708 W. 40th St.
Minneapolis 8

Distr., Normatone Hearing Aid Co.
22 E. 7th St.
St. Paul 1

Otarion Models B-15 & B-30

Otarion Models F-1 & F-3

Otarion Model H-1, Custom "5"
Mfr., Otarion, Inc.
185-7 Ashford Ave.
Dobbs Ferry, N. Y.

Paravox Model D (Top-Twin-Tone)

Paravox Model J (Tiny-Myte)
Mfr., Paravox, Inc.
2056 E. 4th St.
Cleveland 15

Radioear Model 62 Starlet

Radioear Model 72

Radioear Model 82 (Zephyr)
Mfr., E. A. Myers & Sons, Inc.
306 Beverly Rd.
Mt. Lebanon
Pittsburgh 16

Distr., Radioear Corporation
306 Beverly Rd., Mt. Lebanon
Pittsburgh 16

Silvertone Models H-16, J-92, & P-15
Mfr., Johnston Hearing Aid Mfg. Company
708 W. 40th St.
Minneapolis 8

Distr., Sears, Roebuck & Co.
925 S. Homan Ave.
Chicago 7

Solo-Pak Model 99
Mfr., Solo-Pak Electronics Corp.
Linden St.
Reading, Mass.

Sonotone Models 910, 920, 925, 940, 966, 977, & 988
Mfr., Sonotone Corporation
Elmsford, N. Y.

Televox Model E
Mfr., Televox Mfg. Company
1307 Sansom St.
Philadelphia 7

Telex Models 99, 200, 400, 500, 952, 953, & 1700
Mfr., Telex, Inc.
Telex Park
St. Paul 1

Tonamic Model 50
Mfr., Tonamic, Inc.
12 Russell St.
Everett 49, Mass.

Tonemaster Cameo Model
Mfr., Tonemaster Mfg. Co.
128 S. Monroe St.
Peoria, Ill.

Unex Midget Models 95 & 110

Unex Models 200 & 230
Mfr., Nichols & Clark, Inc.
Hathorne, Mass.

Vacolite Models J & J-2
Mfr., Vacolite Company
3003 N. Henderson St.
Dallas 6, Texas

Zenith Miniature 75

Zenith Model Royal

Zenith Model Super-Royal

Zenith "Regent"
Mfr., Zenith Radio Corporation
5801 W. Dickens Ave.
Chicago 39

(All aforementioned hearing aids have vacuum tubes.)
Accepted hearing aids more than five years old have been omitted from this list for brevity.

Transistor Hearing Aids Accepted

Acousticon Model A-300	1 transistor and 2 tubes
Acousticon Model A-310	1 transistor and 2 tubes
Acousticon Model A-330	3 transistors
Acousticon Model A-335 Mfr., Dictograph Products Inc. 95-25 149th St. Jamaica 35, N. Y.	3 transistors
Audivox Model 71 Mfr., Audivox, Inc. 123 Worcester St. Boston 18	3 transistors
Beltone "Concerto" Model Mfr., Beltone Hearing Aid Co. 2900 W. 36th St. Chicago 32	3 transistors
Maico Transist-Ear Model O Mfr., The Maico Company, Inc. 21 N. 3rd St. Minneapolis 1	3 transistors
Micronic "All American" Hearing Aid Mfr., Audivox, Inc.—Successor to Western Electric Hearing Aid Division 123 Worcester St. Boston 18	3 transistors
Microtone Model T1 (Red Dot)	3 transistors
Microtone Model T1 (Yellow Dot)	3 transistors
Microtone Model T31 (Micro-Mite)	1 transistor and 2 tubes
Microtone Model "Skylark" Mfr., The Microtone Corporation 758 S. Mississippi River Blvd. St. Paul 1	3 transistors
Otarion Model C-15	1 transistor and 2 tubes
Otarion Model D-1	3 transistors
Otarion Model F-22 Mfr., Otarion, Inc. 185-7 Ashford Ave. Dobbs Ferry, N. Y.	1 transistor and 2 tubes
Paravox Model KM (TRANSonic) Mfr., Paravox, Inc. 2056 E. 4th St. Cleveland 15	3 transistors

Radioear Model 820 — 3 transistors
Mfr., E. A. Myers & Sons, Inc.
306 Beverly Rd.
Mt. Lebanon
Pittsburgh 16

Distr., Radioear Corporation
306 Beverly Rd.
Mt. Lebanon
Pittsburgh 16

Sonotone Model 1010 — 1 transistor and 2 tubes

Sonotone Model 1111 — 3 transistors
Mfr., Sonotone Corporation
Elmsford, N. Y.

Telex Model 954 — 1 transistor and 2 tubes

Telex Model 956 — 3 transistors
Mfr., Telex, Inc.
Telex Park
St. Paul 1

Unex Model TR-3D — 3 transistors
Mfr., Nichols & Clark, Inc.
Hathorne, Mass.

Zenith Model Royal-T — 3 transistors

Zenith Model Super Royal-T — 3 transistors
Mfr., Zenith Radio Corporation
5801 W. Dickens Ave.
Chicago 39

Semiportable Hearing Aids Accepted

Ambco Hearing Amplifier (Table Model)
Mfr., A. M. Brooks Co.
1222 W. Washington Blvd.
Los Angeles 7

Aurex Hearing Aids (three types)
Mfr., Aurex Corporation
1117 N. Franklin St.
Chicago 10

Precision Table Hearing Aid
Mfr., Precision Hearing Aids
5157 W. Grand Ave.
Chicago 39

Sonotone Model 50 Professional Table Set
Mfr., Sonotone Corporation
Elmsford, N. Y.

Abstracts from Current Literature

Ear

INFLUENCE OF FOCAL INFECTION ON MÉNIÈRE'S DISEASE. J. I. KEMLER, Eye, Ear, Nose & Throat Month. **32**:697 (Dec.) 1953.

Kemler reports his observations on 29 patients with Ménière's disease, in most of whom the disease was quite severe. All had both cochlear and vestibular symptoms. All except one were proved to have foci of infection. Eighteen had infected coated tongues, 6 had infected tonsils, 3 had infected antra, and 1 had an abscessed tooth. Kemler reports uniformly good results after elimination of the focal infection. Previously, he had observed patients with symptoms of Ménière's disease which cleared up on removal of foci of infection, but had considered this phenomenon as merely coincidental. Because of his observations in this series of cases, Kemler now feels that infectious foci are responsible for Ménière's disease.

JENNES, Waterbury, Conn.

GLOMUS TUMORS OF THE TEMPORAL BONE. C. D. RIGGS and M. J. TAMARI, Eye, Ear, Nose & Throat Month. **33**:91 (Feb.) 1954.

The authors present four new cases of glomus jugularis tumor. Guild first described the glomus formation in the temporal bone in 1941 and first used the name glomus jugularis for this. Each glomus consists of blood vessels of capillary caliber with numerous epithelioid cells between the vessels. Innervation and blood supply come from the same trunks that supply the carotid body, namely, the glossopharyngeal nerve and the ascending pharyngeal artery. The first case of a tumor of the glomus was reported in 1945, by Rossenwasser, and he suggested the name "non-chromaffin paraganglioma."

The clinical symptoms commonly reported are tinnitus, impaired hearing, discharge, and dizziness, with such objective findings as polypoid masses in the external canal, discharge, a bulging bluish discolored drum, and facial paralysis. Glomus tumors show an extreme tendency to bleed when traumatized either in the external canal or through the tympanic membrane. The tumor usually grows very slowly and has a tendency to recur after a variable interval, if not completely removed. Although histologically benign, the lesion is locally invasive. Early surgical removal of the tumor is the treatment of choice; postoperative x-ray treatment is recommended in patients in whom the tumor cannot be removed completely or when extensive hemorrhage prevents radical operation.

JENNES, Waterbury, Conn.

PITFALLS OF FENESTRATION SURGERY. L. W. ALEXANDER, Eye, Ear, Nose & Throat Month. **33**:96 (Feb.) 1954.

Patients must be carefully selected for the fenestration operation. The otologic criteria must first be met; the patient must have stapedial fixation, and the impairment of hearing in the conversational frequencies must be demonstrated not to be the result of degeneration of the auditory nerve. This operation should not be performed in emotionally unstable persons or in patients who are elderly or who are poor surgical risks.

A good physician-patient relationship must be maintained. The otologist should not persuade the patient to accept operation, but merely present the facts with a clear indication of the prognosis. The final decision must be the patient's.

A complete physical and laboratory investigation is indicated in every case before operation. Attention to asepsis is highly important and cannot be taken for granted. Nurses and surgical assistants require special training. Prophylactic antibiotic therapy is advisable.

It is necessary to observe certain precautions at operation; technical pitfalls in performing the minutiae of the detailed technique of the fenestration operation must be avoided. Accidents may occur during operation; these must be avoided if possible, but if they do occur they must be corrected by adequate repair. It is essential to prevent postoperative osteogenic closure of

the fenestra, as this and the development of labyrinthitis are the chief causes of unsatisfactory end-results. The final pitfall in the fenestration operation, however, is to set the standards of success too low. The improvement must be such so that the patient can comprehend ordinary conversation and must experience complete rehabilitation for social and economic contacts.

JENNES, Waterbury, Conn.

THE TOXIC EFFECT OF STREPTOMYCIN AND DIHYDROSTREPTOMYCIN UPON THE VIIITH CRANIAL NERVE. J. E. MINKENHOF and J. B. v. DEINSE, J. Laryng. & Otol. **68**:401-406 (June) 1954.

The accepted opinion that dihydrostreptomycin is less toxic to the vestibular apparatus than is streptomycin but more toxic to the cochlea is further substantiated. Two notable conclusions drawn from this study of 55 patients suffering from tuberculous meningitis are first, that the labyrinths of patients suffering from tuberculous meningitis lost their excitability later and less frequently after intramuscular and intrathecal injection of dihydrostreptomycin than after injections of streptomycin, and second, in the authors' opinion the intrathecal injection of dihydrostreptomycin for more than two weeks is strongly contraindicated.

The impairment of hearing can be expected following the intramuscular administration of 2 gm. of dihydrostreptomycin daily for a period of two months.

In spite of the undesirable effects of these drugs, all patients suffering from tuberculous meningitis should be treated with intramuscular and intrathecal injections of streptomycin.

LEJEUNE and NORMAN, New Orleans.

Pharynx

USE OF LONG-ACTING LOCAL ANAESTHESIA IN TONSILLECTOMY: REPORT OF 50 CASES. J. L. GLASHOW, Eye, Ear, Nose & Throat Month. **33**:418 (July) 1954.

Glashow reports the use of Efocaine in a series of 50 cases of tonsillectomy in adults. General anesthesia was used in 21 cases and local infiltration anesthesia of 1% procaine hydrochloride with 1:40,000 epinephrine in the remaining 29 cases. The Efocaine was used only after completion of the operation with control of all bleeding and oozing. With a 1 cc. tuberculin syringe and a No. 25 gauge needle, between 0.5 and 1.0 cc. of Efocaine solution was used in each faucial tonsillar fossa or in the lingual tonsillar bed. The solution was injected into the deeper submucosal tissue in from 10 to 20 sites on each side in a random pattern, each site receiving between 0.05 and 0.1 cc. The solution was also injected into areas of the anterior and posterior tonsillar pillars. Glashow reports that the lack of postoperative pain in these patients was extremely gratifying. There was neither retardation nor complication in the wound healing of any of the patients, who have been followed postoperatively for from 2 to 26 months.

An editorial note expresses awareness of the recent reports concerning the potential hazards of Efocaine and suggests that those who undertake its use should be as familiar with the favorable as well as the unfavorable aspects.

JENNES, Waterbury, Conn.

THE TONSIL AND ADENOID QUESTION AS SEEN BY THE INTERNIST. T. L. BADGER, J. A. M. A. **154**:568 (Feb. 13) 1954.

This internist, after some detailed discussion, believes that too many tonsils are being taken out, yet he is "persuaded" that this is not true. Individual case histories of results have not convinced him. He is interested in the adoption of modern life-table methods of statistical analysis in a retrospective study for determining the benefits, the hazards, and the causes of death associated with the removal of the tonsils and adenoids.

The physician, though dependent upon the skilled otolaryngologist for general tonsillectomy, should not regard the removal of these organs as a trivial procedure. The referring physician shares the responsibility from the point of view of indications, preoperative preparation, and postoperative care.

GORDON, Philadelphia.

THE TONSIL AND ADENOID QUESTION AS SEEN BY THE PEDIATRICIAN. R. C. ELEY, J. A. M. A. **154**:571 (Feb. 13) 1954.

The pediatrician makes a plea for the closest cooperation between the referring physician and the otolaryngologist and comments on some of the conditions he has found, such as impaired hearing, mouth breathing, anorexia, otitis media, and numerous health factors.

He also points up the necessity of emotional trauma that may take place and the value of improved knowledge of the psychological effect of hospitalization and the improvement of anesthesia and surgical techniques, as well as proper positioning of the patient on the operating table. He warns of the possibility of the bulbar type of poliomyelitis and to avoid the operation of tonsillectomy during or near the poliomyelitis season. This author firmly believes in the hazard of poliomyelitis.

GORDON, Philadelphia.

THE TONSIL AND ADENOID QUESTION AS SEEN BY THE OTOLOGIST. G. D. HOOPLE, J. A. M. A. **154**:573 (Feb. 13) 1954.

The otologist confines himself chiefly to the adenoid problem. He comments on secretory catarrh of the middle ear, allergy, infected lymphoid tissue in the nasopharynx, etc. He believes that if the tonsils are infected they should be removed in the cases that come up for adenoid evaluation, but a thorough removal of the lymphoid elements of the nasopharynx is more important. A cogent reason why operation should be instituted as soon as possible is that another episode may be just around the corner, and this episode may be the one that will really cripple the hearing in one or both ears.

He details the importance of removing the adenoid under direct vision, using judiciously the adenotome, biting forceps, and curet. The Lothrop retractor is best to obtain proper vision. Secondary adenoidectomies require the use of biting forceps. A thorough technique causes less postoperative bleeding.

He is averse to the use of radium application at all times and has always believed that a "carefully performed adenoidectomy abolishes the need for the use of radium."

GORDON, Philadelphia.

THE TONSIL AND ADENOID QUESTION AS SEEN BY THE LARYNGOLOGIST. L. R. BOIES, J. A. M. A. **154**:575 (Feb. 13) 1954.

The laryngologist emphasizes clear visualization, good hemostasis, and a skilful and thorough operation. It takes time to perform an adenoidectomy—often 15 to 20 minutes or more. Repeated attacks of tonsillitis or adenoid infection and hypertrophy to the extent of obstruction call for tonsillectomy. The hazard of hemorrhage is minimal if care and thoroughness is used, and the type of anesthesia that is preferred is intratracheal.

GORDON, Philadelphia.

ABSENCE OF TONSILS AS A FACTOR IN THE DEVELOPMENT OF BULBAR POLIOMYELITIS. G. W. ANDERSON and J. L. RONDEAU, J. A. M. A. **155**:1123 (July 24) 1954.

The authors discuss the point that many investigators have advanced definite evidence that a bulbar type of response is more likely to develop in persons who have undergone tonsillectomy during the month prior to onset of poliomyelitis. They present a full study of this problem, with much data and certain interpretations. They comment on the permeability of the medullary capillaries among other points but feel that tonsillectomy facilitates a direct invasion of the throat. Southcott has suggested that the "trauma of tonsillectomy renders the motor nerves of the tonsillar region more accessible to the entry of virus to them from the pharyngeal surface." It may well be that the virus progresses to the medulla along the fibers of the 9th and 10th cranial nerves.

It is the present belief of the authors that the escape of virus following viremia does not constitute a satisfactory explanation for the frequency of the bulbar response.

They finish the main body of their article by stressing the importance of suitable indication for tonsillectomy before operation is undertaken.

GORDON, Philadelphia.

PLASTIC REPAIR OF THE MUCOUS MEMBRANE AFTER CLOSED FOSSA TONSILLECTOMY. E. B. EMERSON JR., J. A. M. A. **155**:1154 (July 24) 1954.

The author presents a technique for closure of the mucous membrane over the postoperative tonsil fossa that he believes fulfills the primary and basic precepts of good surgery: (1) control of hemorrhage, (2) elimination of dead space, and (3) the covering of the mucous membrane surface to allow healing by primary intention. All of this results in added safety to the patient, a shorter postoperative period, less difficult recovery, and the elimination of the threat of hemorrhage except where trauma occurs.

This article is a short one and contains a brief description of the technique, with illustrations. Any reader who would be interested in such should consult the original article.

GORDON, Philadelphia.

TONSIL AND ADENOID SURGERY. RAY E. DEUL JR. and S. J. MORABITO, New York J. Med. **54**:1617 (June 1) 1954.

The authors' experience has been gained in the Geneva General, Willard State, and Sampson Air Force Base Hospitals. The report covers seven years (March, 1946-June, 1953) and concerns 1063 cases. Local anesthesia, butethamine (Monocaine), was injected in adults (no cocaine, no tetracaine [Pontocaine] as surface applications). Ethyl chloride was primary for children, followed by oxygen and ether. Proper usage of the former is regarded as eminently safe for induction only. Intravenous thiopental (Pentothal) sodium was used in some general adult cases. Sedation (barbiturates) was used with caution, especially in children. Untoward occurrences are persistent vomiting (50 cases in children who had received general anesthesia where water, given too soon, was suspected). Two patients had albuminuria before operation, with 102 heart murmurs—43 constant, 59 intermittent. Lack of cervical adenitis does not mean healthy tonsils. Use of penicillin and nonuse of acetylsalicylic acid decreases P. O. bleeding and infection. As in all other surgery, preoperative details must be given scrupulous care; this operation must not be undertaken lightly. Dental prophylaxis is imperative because it may prevent P. O. complications, such as lung abscess. There were two deaths; an adult succumbed to periarteritis nodosa two months after tonsillectomy. Diagnosis was post mortem. A boy of 6 years died from recurrent leukemia four months after removal of tonsils and adenoids.

[ABSTRACTOR'S COMMENT.—This is a careful study of all aspects of tonsil and adenoid surgery, before and after.]

I. W. VOORHEES, New York.

Larynx

CARCINOMA-IN-SITU OF THE LARYNX. ALDEN H. MILLER and H. RUSSELL FISHER, Ann. Otol. Rhin. & Laryng. **62**:358-370 (June) 1953.

Miller and Fisher report 13 cases of carcinoma-in-situ of the larynx treated since 1948 by intralaryngeal stripping of the involved cord followed by radiotherapy for the most part, although two patients were treated by laryngofissure only. Four patients developed recurrence of carcinoma-in-situ, necessitating endolaryngeal forceps removal. The duration of follow-up in the series was under five years for all cases.

STEELE, Kansas City, Kan.

DIAGNOSTIC VALUE OF BRONCHOSCOPY IN TUBERCULOSIS. M. R. HIMALSTEIN, Eye, Ear, Nose & Throat Month. **32**:700 (Dec.) 1953.

Endobronchial involvement in pulmonary tuberculosis is a common and most serious complication. Bronchoscopy aids in the diagnosis and evaluation of endobronchial involvement. The bronchoscopist must be familiar with the pathogenesis of endobronchial tuberculosis and with such factors as incidence, influence of sex, age, and race, and the general procedures employed in the treatment of pulmonary tuberculosis and their effect on endobronchial disease. He must have an understanding of the configuration of the normal bronchial tree, of its distortion following specific collapse therapies, and of its relation to endobronchial tuberculosis.

The indications for bronchoscopy are in general based on symptoms and clinical or x-ray signs secondary to various degrees of bronchial obstruction. Endobronchial stenosis may occur

even in the presence of streptomycin therapy. In general, bronchoscopy is indicated in the absence of expected improvement under treatment. It is necessary that the bronchoscopist, the internist, and the thoracic surgeon function together as a team and be familiar with each other's role.

JENNES, Waterbury, Conn.

THE LARYNGEAL MIRROR. J. J. RAINEY, J. Internat. Coll. Surgeons **21**:539 (April) 1954.

The author briefly summarizes the history of the laryngeal mirror, which was invented by Manuel Garcia, a Spaniard living in London, in 1854. Garcia was the most famous voice teacher of his day, and at that time he already applied scientific investigation to the art of singing.

It is important for us to recall that the most important observation made by Garcia is the fact that the anterior commissure of the vocal cords is concealed in most instances by the epiglottis.

Türck, of Vienna, used the mirror to examine his patients, and Czermak, in Budapest, borrowed Türck's mirrors and used reflection from a lamp for illumination. Czermak went on to develop the concave head mirror with a central opening to reflect light on the laryngeal mirror.

Karl Koller and Sigmund Freud experimented with and discovered cocaine, but it was the former and bolder who saw its possibilities for the purpose of local anesthesia.

The bronchoscope was invented by Gustav Killian, in 1898, and later Chevalier Jackson perfected this instrument and was the leader in furthering the advances of bronchoscopy and esophagoscopy, so that this specialty is nearly perfect today.

Because of the bronchoscope, it is quite possible that the laryngeal mirror has been neglected. The mirror is such a tiny obscure instrument compared with the bronchoscope that some authorities called attention, Emil Glas among them, to the fact that if the young laryngologist were drilled constantly in the art of using the laryngeal mirror, it would be of utmost value. After this he should remove growths from the larynx by the indirect method. Desault stated sometime ago that "the simplicity of an operation is the measure of its perfection."

The skillful use of the laryngeal mirror will reward the young laryngologist in that he will have given each patient a careful laryngeal examination instead of a cursory one.

Marcus Hajek had a power which our ultrascientific age can hardly comprehend, that of speaking on a scientific subject with clarity and brevity. He advised the graduate students in Vienna some 60 years before Garcia: "When you examine the larynx with the mirror, if it is pale you must think of tuberculosis. If it is red you must think of syphilis or cancer. Also, if you examine the larynx with the mirror and you do not see the anterior commissure of the vocal cords, you see little. But if you see the anterior commissure of the vocal cords you see all."

[ABSTRACTOR'S COMMENT.—Chevalier Jackson long ago called attention to the fact that death may lurk in the anterior commissure.]

GORDON, Philadelphia.

GRANULOMA OF THE LARYNX FOLLOWING ENDOTRACHEAL INTUBATION. M. FEINMESSER, L. ALADJEMOFF, and M. S. CHAYEN, J. Internat. Coll. Surgeons **21**:730 (June) 1954.

The authors report two cases of laryngeal granuloma occurring in women following endotracheal intubation. The diagnosis was proved histologically. They have not observed such lesions in children.

They believe that trauma is the likely cause, though there may be an added constitutional factor present. They list 22 references at the end of their article, which points up the fact that the literature on this subject is becoming more frequent.

GORDON, Philadelphia.

Directory of Otolaryngologic Societies *

FOREIGN AND INTERNATIONAL

Canadian Otolaryngological Society
(Société Canadienne d'Otolaryngologie)

President: Dr. G. Edward Tremble, 1390 Sherbrooke St. West, Montreal, P. Q.
Secretary: Dr. G. Arnold Henry, 170 St. George St., Toronto.
Place: Bigwin Inn, Lake of Bays, Muskoka, Ont. Time: June 16-18, 1955.

International Bronchoesophagological Society

President: Dr. André Soulas, 184 Avenue Victor Hugo, Paris 16.
Secretary: Dr. Chevalier L. Jackson, 3401 N. Broad St., Philadelphia 40.
Meeting: Third International Congress of Bronchoesophagology.
Place: Lisbon, Portugal. Time: Oct. 10-13, 1954.
President of Congress: Dr. Iberto Luis de Mendonca.
Secretary of Congress: Dr. Antonio Da Costa Quinta, Avenida de Trinidade, Lisbon 20.

International Congress of Audiology

Place: Leyden, Netherlands.
General Secretary: Dr. H. C. Huizing, 182 Oostersingel, Groningen, Holland.

International Course in Paedo-Audiology

Place: Groningen, Netherlands.
General Secretary: Dr. H. C. Huizing, 182 Oostersingel, Groningen, Holland.

Pan-American Association of Oto-Rhino-Laryngology and Broncho-Esophagology

President: Dr. Juan Manuel Tato, Azcuenaga 235, Buenos Aires, Argentina.
Secretary: Dr. Chevalier L. Jackson, 3401 N. Broad St., Philadelphia 40.
Meeting: Fifth Pan-American Congress of Oto-Rhino-Laryngology and Broncho-Esophagology.
Place: San Juan, Puerto Rico. Time: February, 1956.
President of Congress: Dr. Juan H. Font, Medical Arts Building, San Juan.

Sixth International Congress of Otolaryngology

President: Dr. Arthur W. Proetz, 3720 Washington Blvd., St. Louis.
General Secretary: Dr. Paul H. Holinger, 700 N. Michigan Ave., Chicago 11.
Place: Hotel Statler, Washington, D. C. Time: May 5-10, 1957.

NATIONAL

American Medical Association, Scientific Assembly, Section on Laryngology, Otology and Rhinology

Chairman: Dr. Francis W. Davison, Geisinger, Memorial Hospital, Danville, Pa.
Secretary: Dr. Hugh A. R. Kuhn, 112 Rimbach St., Hammond, Ind.
Place: Atlantic City, N. J. Time: June 6-10, 1955.

* Secretaries of societies are requested to furnish the information necessary to keep this list up to date.

AMERICAN ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

President: Dr. Walter H. Theobald, 307 N. Michigan Blvd., Chicago 1.
Executive Secretary-Treasurer: Dr. William L. Benedict, 100-1st Ave. Bldg., Rochester, Minn.

AMERICAN BOARD OF OTOLARYNGOLOGY

President: Dr. Frederick T. Hill, Professional Building, Waterville, Maine.
Secretary-Treasurer: Dr. Dean M. Lierle, University Hospitals, Iowa City.
Examinations: Hotel Marshall, Richmond, Va., March 6-10, 1955; Palmer House, Chicago, October, 1955.

AMERICAN BRONCHO-ESOPHAGOLOGICAL ASSOCIATION

President: Dr. Clyde A. Heatly, 11 N. Goodman St., Rochester, N. Y.
Secretary: Dr. F. Johnson Putney, 1719 Rittenhouse Sq., Philadelphia 3.
Place: Hollywood Beach Hotel, Hollywood, Fla. Time: March 15-16, 1955 (afternoons only).

AMERICAN LARYNGOLOGICAL ASSOCIATION

President: Dr. Henry B. Orton, 224 Delavan Ave., Newark 4, N. J.
Secretary: Dr. Harry P. Schenck, 326 S. 19th St., Philadelphia 3.
Place: Hollywood Beach Hotel, Hollywood, Fla. Time: March 13-14, 1955.

AMERICAN LARYNGOLOGICAL, RHINOLOGICAL AND OTOLOGICAL SOCIETY, INC.

President: Dr. Kenneth M. Day, 121 University Place, Pittsburgh.
Secretary: Dr. C. Stewart Nash, 708 Medical Arts Bldg., Rochester 7, N. Y.
Place: Hollywood Beach Hotel, Hollywood, Fla. Time: March 15-16, 1955 (mornings only).

SECTIONS:

Eastern.—Chairman: Dr. Daniel S. Cunning, 118 E. 53rd St., N. Y. 22.
Place: Hotel Warwick, Philadelphia. Time: Jan. 7, 1955.
Southern.—Chairman: Dr. William C. Wolfe, 332 W. Broadway, Louisville 2.
Place: Medical School Auditorium, Charlottesville, Va. Time: Jan. 22, 1955.
Middle.—Chairman: Dr. French K. Hansel, 634 N. Grand Blvd., St. Louis 3.
Place: Sheraton-Cadillac Hotel, Detroit. Time: Jan. 24, 1955.
Western.—Chairman: Dr. Guy L. Boyden, 1735 N. Wheeler Ave., Portland 12, Ore.
Place: The Town House, Los Angeles. Time: Jan. 15-16, 1955.

AMERICAN OTOLOGICAL SOCIETY, INC.

President: Dr. D. E. Staunton Wishart, 170 St. George St., Toronto 5, Canada.
Secretary-Treasurer: Dr. John R. Lindsay, 950 E. 59th St., Chicago 37.
Place: Hollywood Beach Hotel, Hollywood, Fla. Time: March 17 (afternoon), 18 (forenoon and afternoon), and 19 (forenoon), 1955.

AMERICAN OTORHINOLOGIC SOCIETY FOR THE ADVANCEMENT OF PLASTIC AND RECONSTRUCTIVE SURGERY, INC.

President: Dr. Matthew S. Ersner, 1915 Spruce St., Philadelphia 3.
Secretary: Dr. Louis Joel Feit, 66 Park Ave., New York 16.

AMERICAN SOCIETY OF OPHTHALMOLOGIC AND OTOLARYNGOLOGIC ALLERGY

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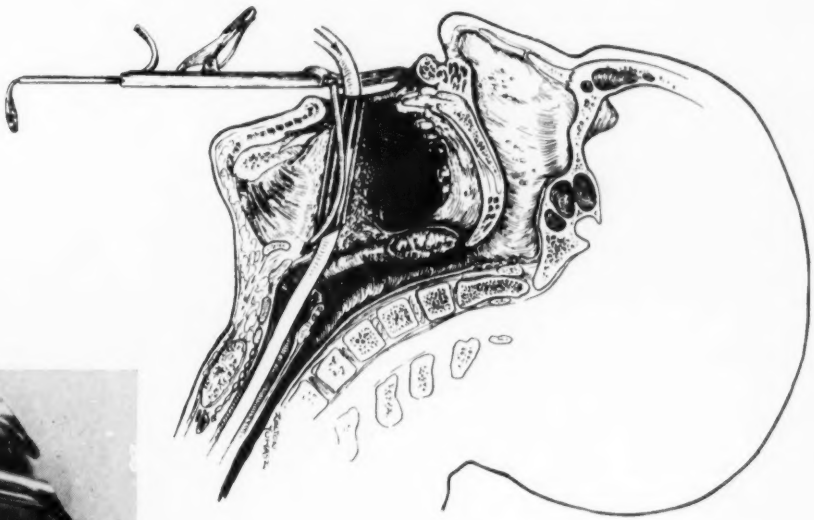

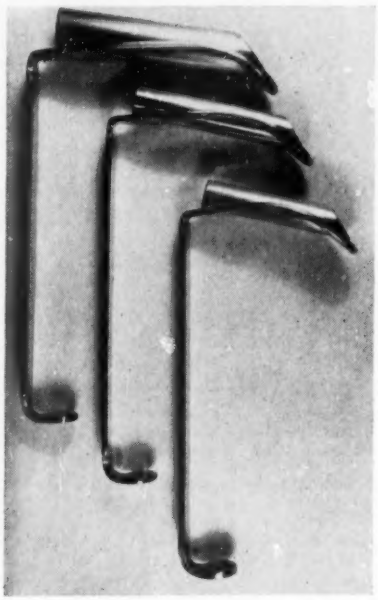

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*Barton, R. T.: Instrument for endotracheal anesthesia during oro-pharyngeal surgery. J. A. M. A. 153:1017 (Nov. 14) 1953.

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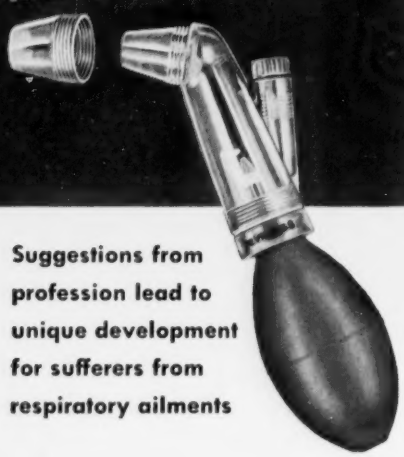

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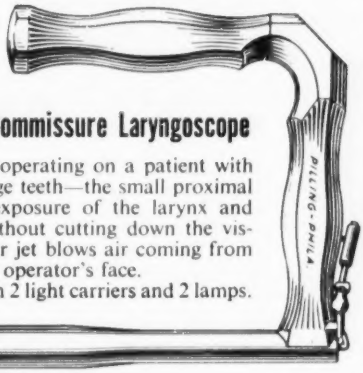

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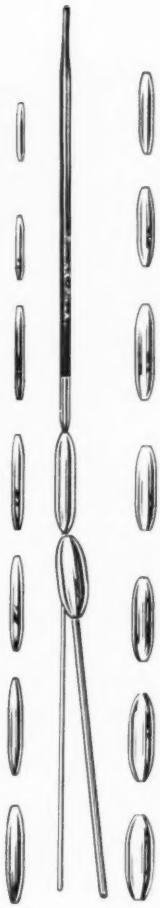

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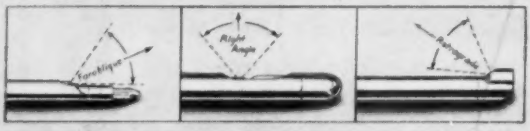

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1. Harrison, W. J.: Ocular Therapeutics, Springfield, Ill., Charles C Thomas.

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